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NATURAL HISTORY OF MAN

BY

A. DE QUATREFAGES

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THE ENGLISHMAN.

White Race, European Branch.—The head has a beautiful oval form, the nose is large and straight, the aperture of the mouth moderate in size, inclosed by delicate lips: the teeth are arranged vertically; the eyes are large, wide open, and surmounted by curved brows. The forehead is advanced, and the face well proportioned; the hair is glossy, long, and abundant.

THE

NATURAL HISTORY OF MAN:

A COURSE OF ELEMENTARY LECTURES.

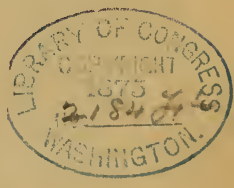
BY

A. DE QUATREFAGES,

MEMBER OF THE ACADEMY OF SCIENCES; PROFESSOR IN THE MUSEUM OF NATURAL HISTORY.

TRANSLATED FROM THE FRENCH,

By ELIZA A. YOUMANS.



WITH AN APPENDIX.

NEW YORK:
D. APPLETON AND COMPANY,
549 AND 551 BROADWAY.
1875.

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TRANSLATOR'S PREFACE.

The study of the races of mankind in recent times, by the method of Natural History, has given rise to an important branch of knowledge known as the science of Anthropology. Societies have been established in various countries for its promotion, and many learned works have been written upon it in different languages. The subject has, moreover, now become one of such great public interest, that it is important it should be presented in its rudiments for the benefit of beginners. In this country, especially, where all the great races of the world—European, African, Asiatic, and American—are thrown together on an immense scale, and practical problems of great difficulty arise from the interaction of diverse foreign populations, it is desirable that broad scientific views of the subject should be widely disseminated.

The author of this little volume of lectures, Prof. de Quatrefages, of Paris, is one of the eminent founders of Anthropological Science, and he has also shown himself to be a most successful popular teacher of the subject. In the clearness and simplicity of his statements, the felicity and fullness of his illustrations, the colloquial vivacity of his style, and the skill with which he brings large questions within the range of ordinary apprehension, he certainly has but few equals. His elementary lectures on the "Natural History of Man," delivered to audiences of work-

ing-people in Vincennes, were extensively circulated upon the Continent in different languages; and the translations of several of them, printed in *The Popular Science Monthly*, have been received with such favor as to induce their republication in this collected form.

Upon certain fundamental questions in Natural History, such as the nature of species, and the origin of man, wide differences of opinion have latterly grown up among naturalists, and are contested with great earnestness by the respective parties. The theory of development, which teaches that the higher forms of life are derived from the lower, is now maintained by many eminent scientific men in Germany, England, and this country; but Prof. de Quatrefages holds to the old views which still prevail in France, and he enforces them with his usual ability in the following pages. That this little book may fairly represent the present state of opinion upon the subject, it has been thought best to give briefly the arguments on the other side in an Appendix. The objections to Prof. de Quatrefages's positions, there stated, have been kindly furnished by one of our leading biologists, Prof. Theodore Gill, of the Smithsonian Institution; and the notes of the Appendix, when not otherwise accredited, are on his authority.

It is proper to remark, however, that these differences of opinion are of minor importance in relation to the objects of this book. It has been translated, because it is the most admirable popular introduction to the study of the races of mankind that has yet appeared; and, in the work of translation, the author's style of exposition has been followed as literally as possible.

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THE NATURAL HISTORY OF MAN.

LECTURE I.

THE UNITY OF THE HUMAN SPECIES.

GENTLEMEN: Each of my fellow-laborers in science comes here to lecture to you, and selects the subject which habitually occupies him. Some tell you of the heavens, the earth, the waters; from others you get the history of vegetables and animals. As I am Professor of the Natural History of Man at the Museum, I ask myself why I should not speak to you of man.

There is evidently as much interest for us in the history of our own species as in that of animals, even of those most useful to us. Indeed, at the present time, the mind is drawn toward this study by an irresistible movement. Formerly, Anthropology, the natural history of man, was not represented in philosophical bodies, nor by the periodical press. Now, in Paris alone there are two Philosophical Societies occupied exclusively with this science, and two large publications equally devoted to it. At the Museum the teaching of anthropology is older. It is there aided by a collection which is still the best in the world.

I do not hesitate to say that it is one of the glories of France to have given by these methods an example to the

entire world—an example followed to-day in America as well as in Europe. And I wish to make you take a part in this movement, by giving you some serious notion of the *ensemble* of the human family.

My task, gentlemen, is more difficult than is that of my associates. In all these lectures we are to speak of only a single being, man. Consequently, there will be an intimate union between them, so much so that any person who should miss a lecture would find difficulty in thoroughly understanding those that follow. To remove this difficulty, I mean to shape my teaching so that each lecture will form as definite a whole as possible. Then, at the commencement of each lecture, I shall endeavor to give, in a few words, a *résumé* of the preceding. In this way I hope to carry you to the end without ceasing to be understood.

Each lecture, then, will be a sort of chapter of what we might call *Popular Anthropology.*

By-and-by I hope that these lectures will be collected into a volume, and I shall be very proud if one day they merit the adjective I have employed—if, in reality, they become popular among you.

Let us enter, then, upon our first chapter. Since man is the subject of our discourse, we must first ask what he is. But, before answering, I ought to enter into some explanation.

This question has been often asked, but generally by theologians or by philosophers. Theologians have answered in the name of dogma and religion; philosophers in the name of metaphysics and abstraction. Let it be well understood between us that I shall take neither of these grounds, but shall avoid, with great care, both that of theology and that of philosophy. Before I became professor at the Museum, I was occupied with the study of animals—I was a naturalist. It is as a naturalist that I have taken my chair at the Institute. At the Museum I

remained what I was, and nothing else. I shall continue the same at Vincennes, leaving to theologians theology, to philosophers philosophy, limiting myself to science, and especially to natural science.

Let us now return to the question I was about to put: What is man?

It is evidently useless to insist that man is neither a mineral nor a vegetable—that he is neither a stone nor a plant. But is he an animal? No, indeed, especially *when we take into account all which exists in him.* And I am sure that in this respect you all agree with me.

Certainly none of you would wish to be compared with cattle that ruminate, with hogs that wallow in the mire. Nor would you wish to be classed with the dog, notwithstanding all the qualities which make him the friend and companion of man; nor with the horse, though it should be with Gladiator.*

Man is not an animal. He is widely distinguished from animals by numerous and important characters. I shall here only refer to his *intellectual superiority*, to which belongs articulate speech, so that each people has its special language; *writing*, which permits the reproduction of this language; *the fine arts*, by the aid of which he conveys, and, in some sort, materializes the conceptions of his imagination. But he is distinguished from all animals by two fundamental characters which pertain only to him. Man is the only one among organized and living beings who has the *abstract sentiment of good and evil;* in him alone, consequently, exists *moral sense.*

He is also alone in the belief that there will be *something after this life*, and in the recognition of a *Supreme Being*, who can influence his life for good or for evil. It is upon this double idea that the great fact of *religion* rests.

By-and-by these two questions of *morals* and *religion*

* *See* Appendix A.

will turn up again. We shall, I repeat, examine them, *not as theologians*, but simply as *naturalists*. I will only say for the present that man, everywhere, however savage he may be, shows some signs of *morality* and of *religion* that we never find among animals.

Hence man is a being apart, separated from animals by two great characters, which, I repeat, distinguish him yet more than his incontestable intellectual superiority.

But here the differences end. *So far as the body is concerned*, man is an animal, *nothing more, nothing less.* Except some differences of form and arrangement, he is the equal, only the equal, of the superior animals that surround him.

If we take, for terms of comparison, the species that approach us nearest in general form, *anatomy* shows us that our organs are exactly the same as theirs. We can trace in them, almost muscle by muscle and nerve by nerve, those which we find in man himself.

Physiology, in its turn, shows us, in the body of man, the organs, muscles, nerves, performing exactly the same functions as in the animal. This is a capital fact which daily profits us, both from a purely scientific and from a practical point of view. We cannot experiment upon man—we can upon animals. *Human physiology* has employed this means to discover the functions of our organs. *Physicians* go further still; they bring to the sick-bed the fruit of experiments made upon animals. *Anthropology* also, as we have just seen, applies to these inferior creatures for very important instruction.

But Anthropology should descend much lower than the animals when it would enlighten us completely. Vegetables are not animals, any more than animals are man. But men, animals, and vegetables, are all *organized and living beings.* They are distinguished from minerals, which are

Fig. 1.

The Esquimaux.

Yellow Race, Hyperborean Branch.—The families belonging to the yellow race have high cheek-bones, a lozenge-shaped head, a small, flat nose, a flat countenance; narrow, obliquely-set eyes; straight, coarse black hair; a scanty beard, and greenish-hued complexion.

neither the one nor the other, by certain general facts common to all.

All organized beings have a limited duration; all are born small and feeble; during part of their existence, all grow and strengthen, then decrease in energy and vitality, sometimes also in size; finally all die. Throughout life, all organized and living beings need nourishment. Before death, all reproduce their kind by a seed or an egg (we speak here of species, not of individuals), and this is true even of those which seem to come directly from a bud, from a layer, from a graft, etc.; for from bud to bud, from layer to layer, from graft to graft, we can rise to the seed and to the egg. Finally, then, all organized and living beings have had a father and a mother.

These grand phenomena, common to all living beings, and consequently to man, imply general laws which control them, and which must therefore govern man as well as the plant.

Science every day confirms this conclusion, which might have been reached by reason alone, but which may now be regarded as a fact of *experience*. And I believe I need not dwell here, to make you understand the magnificence of this result.

As for me, I find it admirable that man and the lowest insect, that the king of the earth and the lowliest of the mosses, are so linked together that the entire living world forms but one whole, all the parts of which harmonize in the closest mutual dependence.

From this community in certain phenomena, from this subjection to certain laws equally common, results a consequence of the highest importance. Whatever questions concerning man you may have to examine, if they touch upon any of these properties, of these phenomena common to all organized and living beings, you must interrogate not only animals, but vegetables also, if you would reach the truth.

When one of these questions is put and answered, to make the answer good, to make it true, you must bring man under all the general laws which rule other organized and living beings.

If the solution tends to make man an exception to general laws, you may affirm that it is bad and false.

But also, when you have resolved the question so as to include man in these great general laws, you may be certain that the solution is good, that it is true, and really scientific.

With these data, and these alone, we will now consider the second question of Anthropology, and here it is:

Are there several species of men, or is there but one, including several races?

To be understood, this question requires some explanation.

Look at the drawings I have hung at the bottom of the hall. These figures are part of those I employ in the course at the Jardin des Plantes.*

I have brought but a small number, but they suffice to give an idea of the principal varieties which the human type presents. You have here individuals taken from nearly every part of the world; and this I regard as a very important point. You see that they differ considerably from each other in color, often also in hair, sometimes in proportions, sometimes in features.

Well, our question is, whether the differences presented by the human groups from which these designs were taken are differences of *species*, or if they indicate only differences among *races* that belong to one and the same species.

To answer this question, we must begin by getting a clear idea of what is meant by the words *species* and *race*. In fact, the whole discussion turns on these two words.

* Represented by illustrations of different races in this lecture and throughout the volume.

FIG. 2.

NEW-CALEDONIAN.

Black Race, Eastern Branch.—The black race is distinguished by its short, woolly hair, compressed skull, flattened nose, prominent jaws, thick lips, bowed legs, and black or dark-brown skin.

Unhappily, they have been often taken one for the other, or else they have been badly defined. The discussions which have hence arisen would very quickly cease, if the subject were studied a little more closely.

Let us see if we cannot get precise ideas without going into details impossible here.

Certainly none of you would ever confound an ass with a horse; not even when a horse is small, and there are horses no larger than a Newfoundland dog; nor when an ass attains the size of an ordinary horse, as, for example, our large asses of Poitou. You say immediately, they are different species; here is a big ass and a little horse. And you say the same on seeing, side by side, a dog and a wolf.*

On the other hand, all of you here would give the single name of *dog* to animals which differ from each other, as do the bull-dog and water-spaniel, the greyhound and the lap-dog, the Newfoundland dog and the King-Charles; and you are right.

However, judging by sight alone, even after detailed observation, you see, between the dogs I have just named, differences of size, of proportion, of color, much greater than those which separate the horse from the ass. An ass and a horse of the same size certainly resemble each other much more than the types of dog I have just named.

Further, if you place side by side a black and a white water-spaniel, you will not designate them by different names. You will call them both water-spaniels, although one is black and the other white.

In the case of vegetables you do exactly the same thing. A red rose and a white rose are equally roses; a pear is always a pear, whether you buy two for a sous in the street, or pay three francs at Chevet.

Well, without doubt, your decision is exactly like that of the naturalists. You have answered, just as they do,

* *See* Appendix B.

the question of species and race—a question that at first appears very complicated, because of the confusion before referred to. Here, then, is one more example to prove that, under many circumstances, popular observation and good sense go straight to the mark, as well as the labors of science.

Indeed, let us translate into general scientific language what I have just said of your views, and I am very sure not to be mistaken with regard to them.

The meaning of this judgment is, that an animal or a vegetable may vary within certain limits. The dog remains a dog, whatever its general form, its size, its hair; the pear remains a pear, whatever its size, its savor, the color of its skin.

From these facts, which I simply allude to, it results that these variations may be transmitted by way of generation. You all know that the union of two water-spaniels will produce water-spaniels; that the union of two bull-dogs gives bull-dogs.

It results, finally, in a more general way, that individuals of the same species may cease to resemble each other in an absolute manner, may sometimes even take very different characters, without becoming isolated and forming different species. As we have just said, *the dog remains a dog*, whatever its modifications.

Well, these groups, formed by individuals which have departed from the primitive type, and have formed distinct secondary groups, are precisely the ones that naturalists call races.

You understand why we constantly speak of races of cattle, horses, etc. There is, in fact, but one species of domestic cattle, which has given birth to the *race bretonne*, as well as to the great cattle of Uri with their savage aspect, and to the peaceful Durham. We have, again, but one species of domestic horse, and this species has given

Fig. 3.

A Nouer Chief.

Brown Race, Ethiopian Branch.—The brown race is composed of a great variety of peoples, with nothing in common but a complexion darker than that of the white and yellow races. It is supposed to be a mixture of the white, yellow, and black races.

birth to the little Shetland pony, of which I spoke just now, and to those enormous brewers' horses that we see in the streets of London. Finally, the various races of sheep, goats, etc., have arisen from one and the same species.

We must give more precision to our ideas on this point, because the least vagueness here will make very serious inconvenience. I will cite some further examples taken from vegetables and animals, being careful to choose such as are entirely familiar.

You all know the seed of the coffee-tree. Permit me to give its history. You will see that it is instructive.

The coffee-tree came originally from Africa, where from time immemorial it has been cultivated on the declivities of Abyssinia that slope toward the Red Sea. About the fifteenth century, something like four hundred years ago, the coffee-tree crossed this sea and penetrated into Arabia, where it has since been cultivated, and whence especially we get the famous Mocha coffee.

The use of coffee spread very early and with great rapidity in the East. It penetrated Europe much more slowly, and it was first made use of in France at Marseilles.

Coffee was first drunk in Paris in 1667. The seeds which furnished it were brought in small quantity by a French traveller named Thevenot. Two years afterward, in 1669, Soliman Aga, ambassador of the Sublime Porte in the time of Louis XIV., induced the courtiers of that great king to taste it, and they found it very agreeable. However, its use did not spread for a long time. It was not until the eighteenth century that it began to be generally adopted.

You see that coffee has not been very long in circulation. In fact, it is scarcely a century and a half since it became an article of general consumption by the people of Europe.

Well, during many years Europe remained tributary to Arabia for this commodity. All the coffee consumed in Europe came from Arabia, and particularly from Mocha. Toward the commencement of the eighteenth century the Dutch attempted to import it into Batavia, one of their colonies in the Indian Archipelago. They succeeded very well. From Batavia some stalks were taken to Holland and put in a hot-house, where they succeeded equally well. One of these stalks was brought to France toward 1710, and was placed in the conservatory of the Jardin des Plantes, and there also it prospered and gave birth to a certain number of sprouts.

In 1720 or 1725 (I have not been able to find the precise date), an officer of the French Navy, Captain Desclieux, thought that, since Holland had cultivated coffee at Batavia, he might also acclimate it in our colonies of the Gulf of Mexico. When embarking for Martinique, he took from the Jardin des Plantes three stalks of coffee, and carried them with him. The voyage was long and difficult, by reason of contrary winds. The supply of water proving insufficient, it was necessary to put the crew on rations. Captain Desclieux, like the others, had but a small quantity of water to drink each day. He divided it with his coffee-plants. Notwithstanding all his care, two died on the passage; only one arrived safe and sound at Martinique. Put at once into the earth, it prospered so much and so well that from it have descended all the coffee-trees now spread over the Antilles and tropical America. Twenty years after, our Western colonies exported millions of pounds of coffee.

You see the coffee-tree, starting from Africa, has reached the extremity of Asia on the east and America on the west. Hence, it has nearly traveled round the world. Now, in this long voyage, coffee has become modified.

Passing by the tree, of which we know little, let us con-

sider the seed. We need not be grocers to know the different qualities of coffees and their different production. Nobody would confound Mocha with Bourbon, Rio Janeiro with Martinique. Each of these seeds carries in its form, in its proportions, in its aroma, the certificate, so to say, of its birth.

Whence came these changes? We cannot know with certainty, and explain the why and the how, and follow rigorously the filiation of cause and effect; but, considering the phenomena as a whole, it becomes evident that it is to differences of temperature, of climate, of culture, that all these modifications are due.

This example, taken from vegetables, shows that if we transport to considerable distances different specimens of the same vegetable, placing them in different conditions of cultivation, we obtain different races. Tea transported some years ago into tropical America would present us with like facts.

Take, now, an example from animals. You all know the turkey; but, perhaps, some of you do not know that it came from America. Its introduction into Europe is quite recent.

In America the turkey is wild; and there, in its natural conditions of existence, it presents many characters which distinguish it from our domesticated individuals. The wild-turkey is a very beautiful bird, of a deep-brown color, very iridescent, presenting reflections of blue, copper, and gold, which make it truly ornamental. It was because of its fine plumage that it was first introduced into France. In the beginning no one thought of the turkey as food; and the first turkey served at table in France was in 1570, at the wedding of Charles IX., three hundred and four years ago.

As soon as the turkey is tasted, it is found that he is too good to be merely looked at. He passes from the

park to the poultry-yard, from the poultry-yard to the farm, and from one farm to another, east, west, north, and south. At present, in almost all France, turkeys are raised and are a considerable object of commerce.

But, in going from farm to farm, in traveling all over our country, this bird has encountered different conditions of existence, differences of nourishment and temperature, and never the primitive conditions that it had naturally in America. As a consequence of all this, the turkey has also varied, and, to-day, not a turkey in France resembles the wild stock. Generally, it has become much smaller; when it has preserved its deep plumage it has become darker and duller; but some have become fawn-colored, others are more or less white, and others again are spotted with white, gray, or fawn-color.

In a word, almost all the localities to which the turkey has become addicted have given birth to new varieties which have been transformed into *races*.

Now, in spite of these changes, and although they do not resemble their first parents in America, and do not resemble each other, are our French turkeys less the children of the wild-turkey of America? Or, if you like it better, are they less brothers and sisters? Have they ceased to be part of the same species? Evidently not.

What I have just said of the turkey might also be said of the rabbit. The wild-rabbit lives all around us—in our downs, in our woods—and he does not resemble, or resembles but little, our domestic rabbits. These, you know, are both great and small, with short hair, and with silky hair; they are black and white, yellow and gray, spotted and of uniform color. In a word, this species comprehends a great number of different races, all constituting one and the same species with the wild stock which still lives around us.

From these facts that could be multiplied, we have to

draw an important consequence, to which I call your attention:

A pair of rabbits, left in a plain where they would encounter no enemies, in a few years would fill it with their descendants, and, in a little while, all France would be easily peopled. We have just seen that a single stalk of coffee gave birth to all the coffee-trees now found in America.

The wild-turkeys and their domestic offspring, the wild-rabbits and their captive descendants, may then be considered by the naturalist as alike arising from a primitive pair.

Gentlemen, this is the stamp of a species. Whenever you see a greater or less number of individuals, or groups of individuals, if, for one reason or another, you can look upon them as descendants of a single primitive pair, you may say you have before you *a species;* if from group to group there are differences, you say these are *the races of that species.*

Observe carefully, gentlemen, that, in thus expressing myself, I have not stated for certain the existence of this primitive pair of the stock of rabbits or of the stock of turkeys. I affirm no such thing, because neither experiment nor observation—the two guides we should always follow in science—can aid us on this point. I only say to you, every thing is as if they had been derived from a single pair.

You see, after all, the question of *species* and of *race* is not very difficult to comprehend, not even very difficult to settle when we know the wild type, when we have the historic data which enable us to connect with this type the more or less different groups which domestication has detached. But when we do not know the wild type, when the historic data are lost, the question, on the contrary, becomes extremely difficult at the first step, because differ-

ences that we encounter from individual to individual, and, above all, from group to group, might be considered as specific differences.

Happily, Physiology comes now to our relief. We encounter here one of those great and beautiful general laws upon which the established order depends, and which we

FIG. 4.

MEXICAN INDIAN.

Red Race, Northern Branch.—This division is rather imperfect from an ethnological point of view. Its characters are a mixture of the yellow, white, and black races.

admire more the more we study. This is the law of cross-breeding—a law which governs animals as well as vegetables, and is, of course, applicable to man himself.

You know what is meant by the word crossing. We

mean by it all marriages occurring between animals that belong either to two different species, or to two different races. Well, the results of these marriages obey the following laws, which are:

When this union takes place between two animals belonging to *different species*—that is, when we attempt *hybridization*—in the immense majority of cases the marriage is *sterile.* Thus, for example, the experiment of uniting rabbits and hares has been tried thousands of times all over the world. This experiment is said to have succeeded twice. But these two alleged facts are much more doubtful than the results of experiments recently made by a man of true talent, skilled in the art of experimenting, and who believes in the possibility of these unions, who has completely failed. Although he furnished the best conditions for success, he was not more fortunate in his results than Buffon, and the two Geoffroy Saint-Hilaires before him.

So the rabbit and the hare are of such a nature that, although presenting in appearance a great conformity, they cannot reproduce together.*

Such is the general result of crossing two different *species.*

In many cases, the union of two individuals of different species is fertile, but the offspring cannot reproduce. For example, I refer you to the union of the ass and horse. This union produces the mule. All the mules in the world are the offspring of the jackass and the mare. Now, these animals are numerous, for in Spain and in tropical America they are much preferred for work to horses, because of their resistance to fatigue. The *hinny,* less in demand, because less robust than the mule, is the result of an inverse cross; it is the offspring of the horse and the ass. The hinny, like the mule, cannot reproduce its kind.

* *See* Appendix C.

When we wish for either, we must have recourse to the two *species.*

Finally, in extremely rare exceptions, the fertility persists in the offspring, but it is much diminished. It diminishes still more in the grandchildren, and it is extinguished in the third or fourth generation at the most. This is the case when we unite the canary-bird with the goldfinch.

I might here accumulate a mass of analogous facts and details. But over them all would appear a great general fact including them, which is the expression of a law; and here is this fact: notwithstanding observations reaching back for thousands of years, and made on hundreds of species, we do not yet know a single example of intermediate species obtained by the crossing of animals *belonging to different species.*

This general fact explains how order is maintained in the present living creation. If it had been otherwise, the animal world and the vegetable world would be filled with intermediate groups, passing into each other by insensible shades, and, in the midst of this confusion, it would be impossible for even naturalists to make discriminations.

The general conclusion from all this is, that *infertility is the law when animals of different species unite* (HYBRIDIZATION).

When, on the contrary, individuals which are only of *different races*, but of the same species, are brought together, that is to say, when we produce a *mongrel*, is the result the same? No, it is exactly contrary.

These crossings are always fertile, and sometimes more so than the union of animals of the same race. But especially the children and grandchildren are also as fertile as the parents and grandparents; so much so that they propagate their kind indefinitely. The difficulty here is not to procure *mixed races;* the difficulty is, when we

have pure races that we desire to preserve, to keep strange blood from modifying them.

Races thrive by crossing—that is, by the union of different races of the same species, they multiply abundantly around us; such are our street-dogs, our roof-cats, our coach-horses, all our animals where the race is indistinct; because, by cross-breeding in all directions, the differential characters have become confounded.

So far from experiencing difficulty in obtaining offspring from races, the men who are occupied with cattle, with sheep, with horses, amateurs in dogs, in pigeons, know with what watchful care they must protect their favorite race.

Here, then, is a general fact, and from this fact it results that *fertility is the law of union between animals belonging to different races* (MIXED BREEDING).*

Here, gentlemen, you see the great distinction, the fundamental distinction, between *species* and *race.* And, it is all the more important to recognize and record this distinction, as it facilitates experiment. When you have two different vegetables, or two different animals, and wish to know whether they belong to two *distinct species*, or only to *two races of the same species*, marry them. If the union proves immediately fertile, if the fertility is propagated and persists, you may affirm that, notwithstanding the differences which separate them, these vegetables and these animals are only *races of the same species.* If, on the contrary, you see the fertility disappear completely or diminish notably at the first union, if you see it decreasing, and go on diminishing, to disappear at the end of a few generations, you may without hesitation affirm that these vegetables and these animals belong to *distinct species.*†

Gentlemen, I have discoursed at length of vegetables

* *See* Appendix D. † *See* Appendix E.

and animals, of the coffee-tree, of the turkey, of the rabbit, of the dog, of the cat, of cattle, etc., and you may think that I am forgetting man. On the contrary, I have not ceased to think of him.

What is our question concerning man? Distinctly this.

Look once more at these designs. They show you differences, marked enough, between the human groups, although less considerable than at first appears.

Now, we do not know the type or the primitive types of these human groups.

Even when we encounter one or several men, presenting the characters of these types, we cannot identify them, for lack of historical documents upon the subject. Consequently, if we judge by the looks, if we take account only of the men themselves, we cannot decide whether the differences they present are *differences of race or differences of species;* whether man is to be considered as arising from a single primitive stock, or whether we ought to suppose several primitive stocks.

But we have already said, and we again repeat, that *man is an organized and living being;* and, as such, he obeys all the general laws which govern all organized and living beings; he consequently obeys the laws of crossing. These, then, we must interrogate, to find out whether there *is one or several species of men.*

Take, for example, the two most distinct types, those which, more than any others, seem separated by profound differences—the white man and the negro.

If these types really constitute *distinct species*, their union ought to bear the stamp we have found to characterize the unions between animals and vegetables of different species. In the great majority of cases they should be infertile; in all the remainder, slightly fertile; the fertility should soon disappear and they should not be able to form

intermediate groups between the negro and the white. If these two men are only *races of one and the same species*, their union, on the contrary, should be very fertile; the fertility should be kept up by their descendants, and intermediate races ought to be formed.

Fig. 5.

Young Esquimaux.

Well, gentlemen, the facts here are decisive, and admit of no hesitation. It is scarcely three centuries since the white man *par excellence*—the European—made, so to say, the conquest of the world; he has gone everywhere, and everywhere he has found local races, human groups that

do not resemble him; everywhere he has crossed with them, and the unions have been very fertile, sometimes very sensibly more fertile than those of the indigenous people themselves.

And further, in consequence of a detestable institution which happily has never sullied the soil of France, in consequence of slavery, the white has taken the negro everywhere, everywhere he has crossed with his slaves, and everywhere a mulatto population has been formed. Everywhere, also, the negro has crossed with the local groups, and everywhere there have sprung up intermediate races, which, by their characters, proclaim this double origin. The white, finally, has crossed with these mixed breeds, and hence has resulted in certain parts of the globe, and notably in America, an inextricable mass of mixed peoples, perfectly comparable with our street-dogs and roof-cats.

The rapidity with which these mixed races cross and multiply is truly remarkable. It is hardly three centuries, about twelve generations, since the European spread over all parts of the world. Well, we estimate that already one-seventieth of the total population of the globe are mixtures, resulting from the cross of the whites with indige nous peoples.

In certain states of South America where the mixture began earlier, where the European arrived in the first days of discovery, a quarter of the population is composed of cross-breeds, and in some regions the proportion is more than half.

You see, our experience is to-day as complete as possible. Unless we deny all modern science, unless we would make man a solitary exception in the midst of organic and living beings, we must admit that all men form only one and the same species, composed of a certain number of different races; we must, therefore, admit that all men may be considered as descended from a single primitive pair.

You see, gentlemen, we have reached this conclusion, outside of all species of dogmatic or theological consideration, outside of all species of philosophical or metaphysical

Fig. 6.

Sir Salar Jung, K. S. I.
Brown Race, Hindoo Branch.

consideration. Observation and experiment alone, applied to the animal and vegetable kingdom, science, in a word, leads us logically to this conclusion: *there exists but one species of men.*

This result, I do not fear to say, is of great and serious importance, for it gives to the thought of universal brotherhood the only foundation that many people now recognize, that of science and reason.

I hope, gentlemen, that my demonstration has convinced you. However, I am not unaware of the fact, and you doubtless also know, that all anthropologists are not agreed. There are among my fellow-laborers a certain number of men, even of great men, who believe in the plurality of the human species. Perhaps you may have come in contact with them. Well, listen, then, with attention to the reasons they bring in support of their view. You will easily see that all these reasons may be summed up in this: There is too much difference between the negro and the white man to permit them to belong to the same species.

Then you reply: Between the white or black water-spaniel and the greyhound, between the bull-dog and the lapdog, there is much more difference than between the European and the inhabitant of Africa, and yet the greyhound and the water-spaniel, the bull-dog and the lapdog, are equally dogs.

They will perhaps add: How could the same primitive man, whatever his characters might be, give birth to the white man and the negro?

You will answer: How has the wild-turkey, of which we know the origin, of which we know the grandparents, how has the wild-rabbit, which we find still among us, how have they been able to give birth to all our domestic races?

We cannot, I repeat, explain rigorously the how and the why; but this we know, the fact exists, and we find its general explanation in the conditions of existence, in the conditions of the environment.

Now, man, who has progressed upon the earth a much longer time than the turkey or the rabbit, who has been upon the globe for thousands of years, living under the

most diverse, the most opposite conditions, multiplying further the causes of modification by his manners, his habits, his kind of life, by the more or less care he takes of himself—man, I say, is certainly found in conditions of variation much more marked than those which have been encountered by the animals we have cited. It is not, then, surprising that men, from one group to another, present differences of which we here see the specimens. If there is any thing in them to astonish us, it is that these differences are not more considerable.

In your turn you ask of the polygenesists—for this is the name given to the philosophers who believe in the multiplicity of the human species—how is it that when the white man comes to any country whatever, at the antipodes, in America, in Polynesia—how is it, I say, that everywhere he crosses with human groups that differ most completely from him; that these unions are always fertile, and that everywhere he has left traces of his passage in producing a mixed population?

If you press your interlocutor a little, he will quite often deny the reality of species; he will thus put himself in contradiction with all naturalists without exception, botanists or zoologists—with all the eminent minds who, following Buffon, Tournefort, Jussieu, Cuvier, Geoffroy Saint-Hilaire, have studied vegetables and animals, outside of all discussion, and without thought of man.

In thus dealing with the question, the polygenesist falls into disagreement with the best-established science.

Sometimes, also, you will hear him declare that man is an exception, that he has his particular laws, that the arguments taken from plants and animals are not applicable to him. Answer him, then, in the name of physiology, in the name of all the natural sciences, that he is certainly mistaken.

It is quite as impossible that an organized and living

body should escape the laws of organization and life as that material substances should escape the laws that govern inorganic matter. Therefore, man, an organized and living being, obeys, as such, all general laws, and those of crossing like the rest. The conclusion we have drawn is then legitimate, and the nature of the arguments employed to combat it is a further proof in its favor.

Gentlemen, the subject of this lecture, which has occupied about an hour, at the Museum took up an entire course. The exposition has necessarily been brief. But I hope you have seen reasons strong enough to make you accept my view.

If doubts remain, try to come to my lectures. Some of you will be able, perhaps. I sometimes see working-men on the seats of my lecture-room, and I can testify to the interest of some among them. I own I was happy to see the attention they gave to these exalted questions. It would give me great pleasure to see at the Jardin des Plantes some of my audience at Vincennes.

LECTURE II.

THE ANTIQUITY OF MAN.

GENTLEMEN: I shall to-day continue the Natural History of Man. Those of you who were present at our first lecture know that it was devoted to the examination of a fundamental question. We inquired if all the men living upon earth, however they may differ among themselves, are of one and the same species; that is, if they are to be regarded as descended from a single primitive pair.

To answer this question, we appealed to science alone. We started with the principle that, so far as the body is concerned, man is an animal—nothing more, nothing less; that, consequently, all the general laws to which animals are subject bear upon him, and he cannot evade their dominion.

We then asked, not only of animals, but also of plants, What is meant by the word *species?* and we were led to distinguish species from *race.*

Without going into the details I then gave, this distinction is easily established. When two individuals of different species unite, the union is almost always infertile, and, if the first union is fertile, the offspring, either immediately or at the end of a few generations, will reproduce no more. So that, between two species, we cannot establish a third series of individuals, starting at first with a father and a mother taken from two distinct species. The examples I

gave are known to you all. When we unite a jackass with a mare, an ass with a stallion, we obtain a mule or a hinny, and never a horse or an ass; and, to get mules, it is always necessary to have recourse to a jackass and a mare.

When, on the contrary, we take two individuals of two different races of the same species, whatever their differences of exterior conformation, the resulting individual is fertile, and may give birth to an intermediate series of individuals between the two races.

As examples, I took the different races of dogs, of sheep, of cattle. Whatever the skin, the color, the form, the proportions of the dog, he is still a dog; whatever the proportions, the figure, the color of horses or of oxen, they remain horses and oxen. So, when we cross a water-spaniel with a greyhound, a lap-dog with an Havana dog, the offspring are fertile, and we get what are called fertile mixed races.

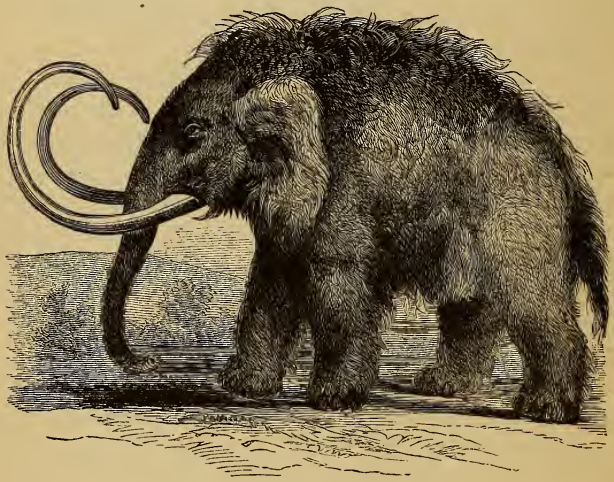
Now, when human beings unite with each other, whatever their exterior differences, whether they are white, or black, or yellow, these marriages are fertile. From this fact, verified a thousand times, we draw the conclusion that there is but one species of men, and that the differences existing between them are only differences of race. Again I say, in reaching this conclusion, we have never gone beyond science. I repeat this declaration, because, in all that I shall say to you, I wish you distinctly to understand that I never put foot outside the domain of science, where alone the scientific man can speak with authority.

The unity of the human species once demonstrated, many problems rise before us.

The first is that of the antiquity of man. Have men been always upon the earth? Did they appear at the same time with the other species of animals? Are they very ancient on the globe? Such are the first questions which present themselves to our minds.

Throughout all time have men lived on the earth? Many of you, doubtless, are already able to answer me. My brother professors of geology and paleontology have probably addressed you on these questions. I shall only recall to you the general facts bearing upon the case.

Fig. 7.



Extinct Elephant, or Mammoth.

You all know what is the action of heat upon certain bodies. For example, you all know that water heated to a certain degree vaporizes; that if this vapor loses a certain quantity of heat, it is liquefied; that in losing still more, it forms a solid body—ice. This ice may become so solid, that in St. Petersburg they have been able to construct it into palaces, and have made cannons of ice that have been fired. You can understand that a sufficient quantity of heat will reduce all bodies to vapor, and that sufficient cold will solidify them.

Now, the facts of astronomy seem to prove that, of old, our earth, with all it contains, and all the materials that compose it, began as a vast, vaporous mass diffused in space. It was a globe of vapor. When the process of cooling set in, this mass became liquid, and, during periods of time which we cannot compute, it was only an immense mass of rocks and of matter melted by fire.

It is needless to insist on the fact that, at this epoch, on the surface of our globe, there were no living beings, and consequently no men.

The cooling progressing, there is formed a pellicle on the surface of the globe, and this pellicle goes on increasing in thickness. This is what we will call the primitive earth. On this primitive earth, during a long period, water could not exist in a liquid state, and consequently there were as yet upon our globe no living beings, for all these beings need water; and, of course, no men.

But the process of cooling continued. The water which was vaporized in the atmosphere fell in torrents on this crust which enveloped the globe; chemical reactions, of a violence of which we can form no idea, were produced. At this moment began the formation of what we call the earth of transport, and the globe entered upon what is known as the Secondary epoch.

Strictly we may say that, from the moment the waters rested in a liquid state upon the surface of the earth, life might begin to manifest itself. In certain thermal waters of high temperature, we find confervæ—microscopic vegetables which are already organized and living. But no animal could yet live in this medium, for the heat would coagulate its albumen. Later, the cooling always progressing and the sea enveloping the greater part of the globe, more complex vegetables appeared. Soon animals, chiefly aquatic, made their appearance, and among them I would mention those gigantic reptiles you have sometimes

seen represented in certain book announcements on the walls of Paris. Mammals—man—could not yet inhabit our globe.

As the cooling progressed, continents were formed by the upturnings of Nature. The time came when true mammals and birds, analogous to living species, appeared in their turn. This was the commencement of the Tertiary epoch. Then, very probably, man might have lived. We shall presently have to ask if he did not exist, at least in the latter part of this period.

The dislocation of the crust of the globe elevated the mountains, dug the valleys, sank the seas, formed the continents, and, toward the end of the Tertiary period, the globe presented a surface much resembling what we see now. Here commences the Quaternary period. This quaternary period presents to us a very remarkable phenomenon.

Up to this time, putting out of account the slight oscillations that have occurred, the globe seems to have cooled in a nearly uniform manner, from the period when it formed only a mass of vapor, down to the Tertiary epoch. With the Quaternary period came a moment wherein a cooling, perhaps sudden, but in any case very marked, showed itself and then disappeared.

At this time, a part of the globe at least, and Europe in particular, was much colder than it is now. We have proof of it in the glaciers of the Alps. Instead of stopping in the place where they do now, these glaciers filled most of the Swiss valleys, descending even in the valley of the Rhone; and from one end to the other of these valleys enormous blocks of rock were transported by the glaciers, and left on the spot. It is these which now constitute what we call erratic blocks.

During the Quaternary epoch, there lived in France very different animals from those which we find now. Among them I may refer to the great cave-bears, which

were remarkable for their size and for their bulging foreheads. I will also mention the hyena. You know that now we have no hyenas, and that they are only found in countries much warmer than France. To the preceding species I will add the rhinoceros. I call attention particularly to an elephant, of which this is the picture (Fig. 7), and which we call the mammoth. This elephant, you see, is easily distinguished from species now living; by its size, first, for it is much larger than they; then by the form of its remarkably recurved tusks; finally and chiefly because, in the place of the naked skin of the elephants we know, he was covered with a thick wool and very long hairs.

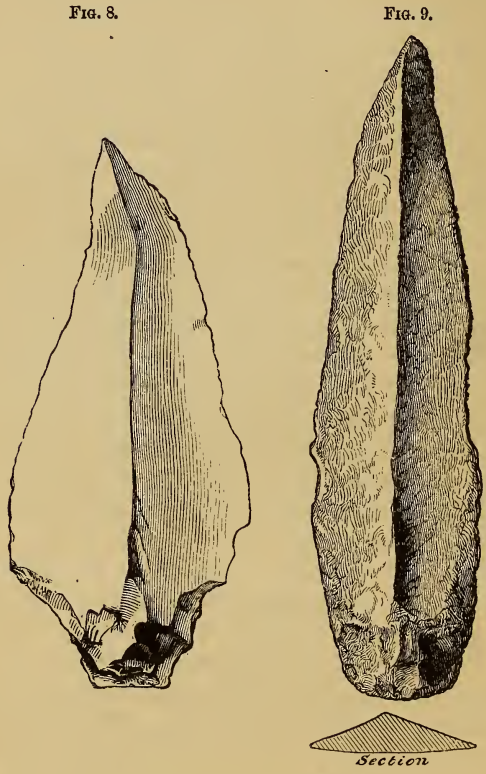
Of these things we are certain; for this elephant has been found preserved whole, with his skin and hair. At different times there have been discovered in the frozen earth of Siberia the dead bodies of these animals. That country contains in such great numbers the tusks of these antediluvian elephants, to employ a vulgar expression, that the commerce in fossil ivory constitutes a considerable source of revenue, and the state reserves a monopoly of it.

I call special attention to this elephant, and we shall presently see why.

The Quaternary period ended as those that preceded it; and then began the present period. Since the time of its commencement, the continents, the flora, and the faunæ, have not undergone any considerable modifications.

Nobody has ever questioned the existence of man at the beginning of the present period, and some have even considered his appearance as the characteristic feature of this period. But did man exist before? To use the common expression, were there antediluvian men? In other words, and to return to scientific language, is man the contemporary of those animal species among which appears the mammoth? May he be found, like the mammoth, in a fossil state?

Such is the question that has been often asked, and which was long answered in the negative. Down to these later times, the most eminent men in Natural History, in



Arrow-shaped Flint Implements.

Geology, in Paleontology, were all agreed on this point; even Cuvier never admitted the existence of fossil man.

To-day we are led by many well-ascertained facts to answer this question very differently. We are forced to

admit that fossil man does really exist, and that man was contemporary with those species of animals I have been speaking of, especially with the mammoth.

This is certainly one of the most remarkable discoveries of modern times! The ground for it was laid by the establishment of a number of facts observed in England, in Germany, in France. But the honor of having brought decisive proofs, which convince everybody, belongs incontestably to two Frenchmen—to M. Boucher de Perthes, and to M. Edouard Lartet.

M. Boucher de Perthes, the eminent archæologist of Abbeville, while inspecting the excavations made in the earth around his native village, at Menchecourt, and at Moulin-Quignon, discovered stones fashioned in a peculiar manner, and the same form was constantly reproduced. It was soon evident to him that this circumstance was not accidental, but that these stones owed their form to human industry. Now, these polished flints (Figs. 8 and 9), these stone hatchets (Figs. 10 and 11), were found in the earth associated with the bones of elephants; whence he concluded that the men who had fashioned them lived at the same epoch with those great mammifers long since extinct.

This conclusion, drawn by M. Boucher de Perthes, was at first vigorously disputed. Some of the men whose decisions have justly the highest authority on questions relating to the history of the earth, thought that the chipped flints and the bones of elephants were found together in the same bed because this bed had been altered. They said: A first bed was formed which inclosed the bones of elephants. On this bed, during the present period, men lived, and have left these chipped flints as a trace of their presence. Then came a mighty tempest, which rolled and confounded together the hatchets and the elephants' bones. Hence we now find them side by side, although the bed in

which they are found contains the remains of two perfectly distinct epochs.

It will be apparent to you that, if, in our day, men were buried in this bed of Menchecourt and of Moulin-Quignon and, if a great storm should come and mingle these modern bones with the hatchets and bones of elephants, our grandchildren would find them all mixed to-

Fig. 10. Fig. 11.

Flint Hatchets.

gether, and yet the men of to-day are not contemporaneous with the hatchets you see before you.

The objection was all the stronger for having been advanced, as I have said, by the highest authorities in Geology. This is why I attach such importance to the facts for which we are indebted to M. Lartet, and which entirely refute these conjectures.

M. Lartet studied at Aurignac, in the south of France,

a burial-place of these remote times. It is a grotto excavated in the side of a hill, at a height which is not attained by water-courses analogous to those of which we find the trace in the neighborhood of Abbeville. This sepulchral grotto at the time of discovery was closed by a slab taken from a bed of rocks at some distance from this point. In the interior were found the bones of seventeen persons, men, women, and children; and before the entrance, the well-attested remains of a fireplace. There were traces of funeral repasts that the first inhabitants of our country were in the habit of making, and such as we sometimes find in our own day among certain European people. In the ashes of this fireplace were found bones scorched by fire, and excrements of wild animals. These bones were those of the bear and rhinoceros. The excrements belonged to a species of hyena contemporaneous with the preceding animals. Here, consequently, man appears as eating the animals in question; as making his repast of those very animals whose contemporaneousness with him had been disputed.

M. Lartet crowned these beautiful researches by discovering in a cave, in the centre of France, a piece of ivory (Fig. 12) on which was unmistakably represented the very mammoth to which I have just called your attention. It is very evident that it could only be made by a man who lived at the same time with this elephant.

In view of M. Lartet's discoveries, we must admit the existence of fossil man, that is to say, the coexistence of our species with the lost species of animals of which I have spoken.

Since this epoch, besides, we have not only found traces of these primitive industries, but *débris* of jawbones, and entire crania. Hence we can judge of the characters which distinguished our first ancestors. Strange to tell, we find that these men who, even in France, warred with stone

weapons such as I have shown you, against the elephant and the rhinoceros, have still at the present day in Europe descendants presenting the same characters.

So man lived in the Quaternary epoch. May we go further, and admit that he also existed during the Tertiary epoch? Was he contemporaneous, not only with the rhinoceros and mammoth, of which I have spoken, but also with earlier mammals?

The question is perhaps still premature. Some facts seem to indicate that it is so; but in such matters it is better to adjourn conviction than to admit opinions that are yet in doubt. Consequently, we shall regard the debate as remaining open.

After demonstrating that man goes back in geologic time to an epoch much anterior to that in which we formerly believed, we are naturally led to ask if it is possible to estimate in figures this antiquity of our species. We are obliged up to the present time to answer, No. We can perfectly establish relative epochs; but we cannot judge of the number of years that each of these epochs represents.

This, however, has been attempted. From calculations of the time required to form a bed of peat, some have attempted to compute the duration of certain periods, of the age of stone, of the age of bronze, and of the age of iron.

But the results have been so discordant as to throw doubt upon the method. Then the accumulations of *débris* thrown up by torrents of the Alps have been studied, and, in particular, the one known under the name of the cone of Tinnière. A railroad has cut through these materials, which have probably been accumulating ever since the commencement of the present epoch, and in the cut there have been found *débris* reaching back in one case to the Gallo-Roman epoch, in others to the Roman epoch—these to the

Fig. 12.

Sketch of Fossil Mammoth on Ivory, found among Cave Relics.

epoch of iron, those to that of bronze, and, finally, to the epoch of stone.

As we know the duration of some of these periods, it has been thought possible by a simple proportion, taking account of the thickness of the beds, to go back to the time of the first formation of the cone. But here, again, I repeat, the results are so uncertain that we do not give them any serious confidence.

We cannot, then, give precise figures. Yet, from all these researches, and from archæologic facts not less demonstrated, it results that it is necessary to go back much further than we have been accustomed to, in seeking for the advent of man upon the earth. Let me cite you just one of these proofs.

You were at the Universal Exposition—probably you entered the Egyptian Temple. At the bottom of the hall, facing the entrance, you saw a statue—that of King Cephren. This statue goes back something like four thousand years before our era. Consequently, it was sculptured about six thousand years ago. Now, you may know that the work was very difficult, for the stone of which it is made is very hard. The statue is remarkably perfect. From this, as well as from other data, we learn that in Egypt, six thousand years ago, civilization was already much advanced. We must, therefore, date back the origin of the Egyptians more than six thousand years. But we shall presently see that Egypt was not the first inhabited country. Man must have come there from his original home. Consequently, his first appearance on the globe will be found much more remote in time.

So we are now certain of the existence of Quaternary man; we already suspect the existence of Tertiary man, and it is in France that the discoveries which led to these conclusions were made.

Is it, then, in our country, in the vicinity of Abbeville,

or of Aurignac, that man *first* appeared? Now, he is found everywhere: did he arise everywhere? or was his original abode at some particular point of the globe, and did he afterward disperse in all directions? If this be so, where is the privileged spot which gave him birth? Such are the questions that arise after that of the antiquity of man.

There has been much discussion on these questions. It has been said, and some still say, that men have originated where we find them. But a more careful study, a more profound knowledge of the laws that regulate organic and living beings, leads to the opposite conclusion.

Observe that here we can no longer appeal to the sciences which hitherto have served as our guide. Anatomy and physiology teach us nothing concerning the place of man's origin, his first dispersion, or his original home. It is all the same with regard to physiology, whether man appeared at a single point, or whether he appeared at several points at the same time. To study these questions we must interrogate another order of ideas and facts, but without on that account changing the method. We must always recur to other organized and living beings. It is to botanical and zoological geography that we now appeal.

Plants and animals are not distributed by chance upon the earth. Their distribution is subject to precise laws; and, because living and organic beings in general obey the same laws, man ought to follow the laws of geography as well as animals and plants.

Now, these laws of botanical and zoological geography teach us that, in certain parts, the flora and fauna are characterized by certain species; that the globe is partitioned off into a certain number of provinces that have their particular vegetables and animals. These provinces have been called *centres of creation*.

It is natural enough to ask if each centre of creation has not had its own particular man, as it has had its peculiar

vegetables and its peculiar animals. Led astray by certain coincidences, more apparent than real, some naturalists have replied in the affirmative. But, whoever will examine the question closely, will find that it is an error; for this mode of reasoning makes man a single exception among all organic and living beings. Now, you know we do not admit this to be possible. Man ought to obey the laws of geography as he obeys the laws of physiology.

I cannot enter into all the details required for the complete demonstration of this statement, but limit myself to two facts that I hope will suffice to convince you.

The first is: not a single species of vegetable, not a single species of animal, is found at the same time all over the globe.

The most wide-spread species occupied at first only a small part of the earth, and man must have carried with him not only certain vegetables but also certain animals, to find them as widely diffused as they are in our day. Notwithstanding this intelligent and voluntary intervention, you well know that there are certain parts of the globe occupied by man in which neither the vegetables that have accompanied us almost everywhere, nor the animals which we habitually transport, can survive. Man, on the contrary, is cosmopolitan in every sense of the word; that is to say, we find him everywhere, amid the ice of the poles, as under the equator.

Hence, if he had originated wherever we find him, he would constitute a single exception among all organic and living beings, whether vegetable or animal.

This reason, alone, ought to make us accept at least this much: that man has, at all events, peopled a part of the globe by emigration.

But we may go much further; and always, in consequence of the law I have just stated, we may say that he had his origin in one spot, and that a narrow one.

In fact, when we study animals, we find that the area occupied by a species, what we call its habitat, is as much less extended as the species is more perfected, more elevated, in the zoological series.

Not only is this true of species, but of types themselves.

Thus, below man, the animal form which most reminds us of the human is, you know, that of the monkey. Are monkeys among the number of the most widely-distributed animals? No. The monkey-type is found neither in very cold countries nor in the greater part of the temperate regions, but only in the warmest parts of the globe. Besides, a great part of Oceanica contains not a single monkey.

If, now, we no longer consider the type, the entire group of monkeys, but only the species which approach nearest to us, we see them occupying an area still more limited. America has not a single species of monkey in common with Africa and Asia. And, when we come to the most perfect monkeys—to those which, by reason of their great resemblance to man, have been called anthropoid, that is, with a human form—we see the area of their habitat is restricted still more and becomes extremely narrow. So the orang-outang, which some have wished to make our ancestor, is found only in the isle of Borneo, or at most, perhaps, in the isle of Sumatra; the gorilla, still another of the species which comes nearest man in his general proportions, occupies only a small part of the western regions of Africa.

Now, man is everywhere, and still he is incontestably, even from the point of view of his body, very superior to the monkeys. He alone has true hands, those marvelous instruments which you know so well how to use; he alone possesses a brain of which the size of the skull attests the development. Without speaking of other characters, man is evidently superior to all monkeys by his hand and his brain.

Well, then, the monkey—which, although so distant from man, still comes nearest to him—occupies but a restricted habitat; while man, the superior being *par excellence*, has originated, you say, simultaneously everywhere!

Fig. 13.

Native of Feejee.
Black Race, Eastern Branch, Papuan Family.

Evidently, gentlemen, to accept this interpretation of facts will be to make him a single exception among all organized beings; and so, I repeat, we can never accept this conclusion.

You see, we are led to admit, not only that man origi-

nated in one single place upon the globe, but further, that this was a limited region—of very small extent. It was probably not greater than the habitat now allowed either to the gorillas or the orangs.

Can we go still further? Can we determine the particular spot of the globe where arose this privileged species which was to go forth and conquer the whole earth? We cannot answer this question with the same confidence as the others. But we may answer it with great probability. According to all appearances, the point where man originated, and whence he emigrated to all parts of the globe, was situated somewhere in the centre of Asia.*

The reasons which lead us to this conclusion are of many kinds. I can only indicate the two following:

Around the elevated central region that you see pictured upon the chart in the heart of Asia, we find the three fundamental types of humanity: the black man, the yellow man, and the white man. Black men are at the present time widely enough dispersed. We see them still, however, in the peninsula of Malacca and in the isles of Andaman. Again, we find traces of these blacks in the east of Asia, at the isle of Formosa, at the south of Japan, and in the Philippines: the Melanesia belong to them. The yellow race occupies almost all the southeast part and even the centre of Asia; and finally we know that from this elevated central region came the great white race which to-day rules everywhere—the Aryan race, that to which we belong. The groups, more or less pure, are besides related to each other by a multitude of intermediates which may be regarded as transitional.

It is not only by the features, by fundamental physical traits, that the men found around this immense table-land are interrelated and seem to blend into one another. We see, furthermore, on the sides of this vast table-land, the three essential types of language—the most striking intellectual manifestation of man.

* *See* Appendix F.

We shall come to this question by-and-by, but to-day I may say to you that we distinguish three fundamental forms of human language: monosyllabic languages, in which each word has but one syllable; agglutinated languages, in which the words are welded together; and, finally, flexible languages, which resemble the language now generally spoken in Europe.

Now, we find around this central plateau of Asia the monosyllabic language, *par excellence*, all over the Chinese Empire; on the north an assemblage of peoples speaking agglutinative languages, and extending even to Europe. Then, again, we have the portion occupied by the Aryan race, speaking the flexible languages. So the three linguistic types are represented around this table-land of Asia the same as the three fundamental physical types. It seems that, almost from his cradle, man has presented all the essential modifications that he could undergo.

I pass to another question. Man, starting from a single and limited spot, has spread all over the globe. Consequently, he has peopled the globe by emigration and colonization. Such is the conclusion drawn from actual facts interpreted by science alone. But, is it possible to people the earth by human migration? Some say no; and make this assertion an objection to the ideas that I have just indicated.

I own that, for my part, this has always surprised me. Migrations—colonizations! why, they occur everywhere in history, and particularly in our own history.

Go back as far as we may, we see populations in movement from one end of continents to the other; so that, to say *a priori* that man has always lived where we find him, is to contradict all historical documents.

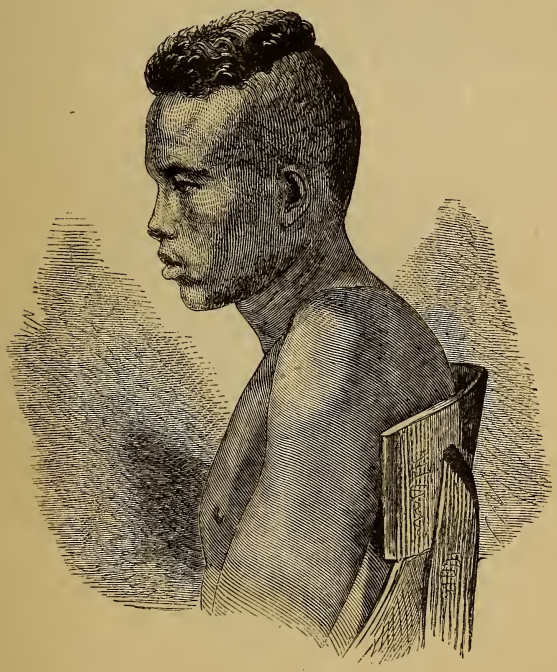
However, some have insisted that certain migrations were beyond human power and intelligence. I will give you two examples to show that migrations are always pos-

sible, even when the conditions in the midst of which they take place seem made expressly to arrest them.

We must distinguish, in migrations, those over land from those across seas.

As to migrations by land, it is very evident that, when

FIG. 14.



SIAMESE DOMESTIC.
Yellow Race, Sinaic Branch, Indo-Chinese Family.

men have to war only against brute Nature, nothing can prevent their passage, especially when they can choose their moment. But I add that men will emigrate, even

when they have to combat all difficulties united, not only the rigors of physical Nature, but also the action of man, who alone absolutely arrests man.

For example, I will cite a fact borrowed from the history of the Calmucks:

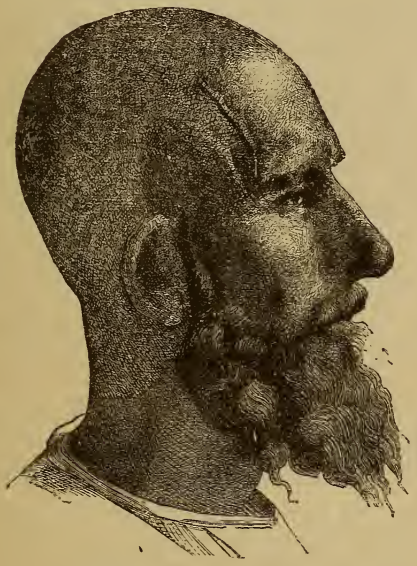
Toward 1616, according to Chinese dates, a horde of these people, for some reason which we do not know, left the country bordering upon China, crossed the whole of Asia, and established themselves on the banks of the Volga. There they accepted the sovereignty of Russia, and for more than a century rendered good service to the empire. But there came a time when the Calmucks found that the Russian yoke was growing more and more oppressive. To throw it off, they decided to emigrate, and return to the country of their ancestors. The tribe had settled on either bank of the Volga, and, in order to come together at a determined place, it had been arranged to start in the dead of winter, at a time when the ice would be strong enough to allow the people on the right bank to gain the left bank of the river. On a given day, all the people of the left bank came together; but some unknown cause hindered the people of the right bank from crossing. The number of emigrants was, however, very considerable, for, including women and children, there were two hundred and fifty thousand. The rear-guard was composed of a select body of horsemen, which counted eighty thousand men. You see, here was an emigration of an entire people.

From the beginning of the journey, the leaders understood that they must hasten; for, at the first news of their departure, the Russians gave orders to pursue the fugitives. A regular army was soon organized and advancing upon them, preceded by a host of Cossacks. These sworn enemies of the Calmucks massacred all those that strayed away any distance from the main body. Although it was the 5th of January, 1771, when they started, this entire

people traversed the intervening regions, arriving on the following September on the frontiers of China.

In this long journey of more than 700 leagues, this wandering horde was constantly pursued by the Russian army, obliged to advance always by forced marches, to open a passage through hostile countries, harassed not only by the Cossacks but also by the Kirgheez, and the Bashkeers, the most savage and warlike inhabitants of these countries, who gave them not a single moment's peace.

Fig. 15.



Tartar of Kasak (Russian).
White Race, European Branch, Slavonic Family.

I forgot to say that the winter, always very severe in these regions, was exceptionally so at this time; that in the first eight days all the beasts of burden perished, and that they had to burn their tents to obtain a moment's

warmth. The women, the children, the aged, and men in their vigor, perished by thousands from the cold. This journey was, in reality, for these people, what the retreat from Russia was for the French army; but with this difference, that the Calmucks emigrated in families, with women and children, so that the disaster would be much more terrible. Winter was followed by summer; and, much as they had suffered from cold, they suffered equally from heat, and, above all, from want of water. There was even a time when the entire body of Calmucks, at the sight of water, disbanded to quench the thirst that devoured them. The rear-guard itself yielded to the temptation. The Bashkeers and the Kirgheez, taking advantage of this disorder, fell upon the multitude and put them to great slaughter. Happily, Kien-Long was engaged in the chase in these parts, and, as is usual with the Emperors of China, he was accompanied by a real army, in which were several batteries of artillery. He fired some pieces of cannon on the Kirgheez and the Bashkeers. The Calmucks recovered their coolness, defended themselves, and all that remained of these people were saved. The emperor immediately gave them food and clothing; then he granted them the country which is occupied by their descendants at the present time.

I will add that Kien-Long caused a column to be erected on the spot where the encounter had taken place. On this column we read an inscription, in very simple words, recording how Kien-Long saved an entire nation. The inscription ends with these words: "Let this place ever be regarded as holy." Gentlemen, I cannot be deceived in saying that you will join in this prayer of one of the greatest sovereigns of China. The place where a nation has been saved merits consecration much more than that where the most brilliant victory has been gained at the price of thousands of human lives.

The hour passes, and I cannot enlarge upon this interesting question of migration as much as I intended. I will content myself with citing one example of migration by sea. It is still more striking, as it bears upon a race constantly referred to when it is wished to prove that men were born where we find them. At the present time, the part of the globe of which I am about to speak is one of those where the peopling by migration is most completely demonstrated. I mean Polynesia.

It occupies a good part of the great Pacific Ocean, and is included in a triangle whose sides, from the Sandwich Islands to New Zealand and to the isle of Pâques, measure, in round numbers, eighteen hundred leagues. The islands dispersed in this immense space are scarcely as much as a grain of sand in the Place de la Concorde. Several among them are smaller than Paris. The isle of Pâques in particular, which forms one of the extremities of the triangle, has precisely the extent of the city-wall of ancient Paris before the annexation of the suburbs—that is to say, fifteen and a half miles in circumference.

You understand what in this vast sea an isle of these dimensions amounts to; and there are others much smaller, which are likewise peopled. The argument drawn from this situation would seem, then, to have great force. How do you suppose, says one, that savages, having no improved means of navigation, have been able to cross such spaces? Why were they not lost in this vast ocean before finding these small isles?

Unfortunately, I cannot go into the detail of facts to show you how inexact is this *a priori* reasoning. I will only say that at the present time we know not only that the people of Polynesia came from some other place, but that they came from the Indian Archipelago. We know, besides, what has been the general course of their migrations, and can trace them on the map. Further, we have

been able to determine the epoch when they took place, relying on precise documents, as positive as the charts on which we depend in writing the history of our middle ages.

These people came from Asia, from a point of the Indian Archipelago that we can determine approximately. They reached the Marquesas Isles in the beginning of our era, or in the years immediately preceding. We know with still greater certainty that the emigration to New Zealand, that is to say, to the most distant portion of Polynesia, took place in the beginning of the fifteenth century, and that the emigration from New Zealand to people the Isles of Chatham occurred scarcely a century ago.

Here we meet with a significant fact. When these emigrants established themselves in the islands of which we are speaking, they found them deserted. This circumstance singularly facilitated their new settlement. If the Calmucks, of whom I just sketched the history, suffered so much, it is because they found men on their route. In our day, if it is still difficult to traverse Africa—if the journey from Timbuctoo has cost the lives of so many courageous travelers—it is because the Tuaregs close the passage to us.

The more we study, the better we know that all over the surface of the globe man surmounts every difficulty, so long as he wars only against Nature. If he is arrested, it is when he encounters man. In brief, man alone can arrest man.

I wish to say a few words also on the last of the questions suggested by this subject.

Man, we have seen, took his departure from a particular place on the globe, and now he is everywhere. Consequently, in his long and multiplied journeyings, he has encountered climates the most extreme, and conditions of existence the most opposite. He has adapted himself to

all. Does it follow that a new-comer, that a European, for example, can establish himself anywhere on the globe and immediately prosper there? You know he cannot. He must become acclimated; and you can easily understand that it must be so. The human body, which has developed under certain conditions of existence, is in harmony with them. If they change, and above all if they change suddenly, it is evident that the entire organism receives a shock; and this shock brings with it suffering that, you know, often ends in death.

Experience has shown that these sufferings have been more grave and frequent when the course of emigration has been from cold toward warm countries—whence certain physicians and anthropologists have drawn the conclusion that there are some countries on the globe that the European cannot inhabit—in which he can never prosper and multiply. Some have even gone further. They have maintained that men could only propagate where they were born; so that, in reality, the Frenchman can only live in France, the Englishman in England, the Dutch in Holland, etc.

This exaggeration needs no refutation. It is already refuted by the existence of our colonies. We know very well that there are some parts of the globe where the European is acclimated almost immediately; not that he can escape all sacrifices, but they are relatively few. I refer you to the case of Acadia, that country in Canada peopled by sixty French families, and which, in a very short time, counted its inhabitants by thousands. I may cite you also to what is passing every day at the Cape, in Australia, at Buenos Ayres.

You see, then, in both worlds, and under the most diverse climates, Europeans prosper, multiply, and work, as they do in Europe. Still there are places where the question is much more difficult of solution, and which have been

considered fatal to Europeans. I will name especially, on the western coast of Africa, our colony of Senegal, and above all that of Gaboon; I will point out, in America, the Antilles generally, and consequently Guadeloupe and Martinique; then French Guiana. Algeria itself has been a subject of lively debate from this point of view. It will seem natural to you that I should dwell a little more upon this last place, because of its special interest for all of us.

From the day of our conquest the question has been, whether the French could be acclimated on the soil of Algeria; and, curiously enough, friends and enemies, Englishmen and Frenchmen, military commanders and physicians, were almost unanimously agreed that it could not be done. They relied on the tables of mortality, which showed an excess of deaths over births. It is easy to see that a country, where the number of those who die gains on that of those who are born, is fated to become depopulated, unless new immigrants repair the annual losses. This is what was said of Algeria, and it is one of the points that I have had to discuss in my lectures.

Now, in spite of documents so often quoted, I do not hesitate to say that Frenchmen have been acclimated in Algeria, and have lived there very well. To arrive at this conclusion I have not denied the figures—the facts cited by those who reach the opposite one; on the contrary, I have accepted them. But I have interpreted them, resting on this principle, which we never abandon, namely, that, as regards his body, man is an animal and nothing else. Consequently, if the laws that govern animality bear heavily on him in certain circumstances, he profits, in return, by advantages that these same laws bring to animals.

Now, before studying the acclimation of man, I began by studying the acclimation of plants and animals. This study taught me that, from the moment when an organized species changes its environment, be it plant, animal, or man,

it must be ready to make two kinds of sacrifices: sacrifices bearing upon the individual, and sacrifices bearing upon the race. In Algeria, the former were shown by the figures of mortality of the army, which were much more considerable than in France. The latter were made apparent by the figures of mortality of children, which, in Algeria, were double those of France.

But I was aware that, when we Europeans tried to transplant to America certain species of domestic animals, the figures of mortality at first were much more considerable than those of the mortality of our army; that the figures of the sacrifices bearing on the race were much higher than those of the mortality of children in Algiers. However, to-day, those animals are acclimated in America, and prosper so well that certain species have run wild, and are, so to speak, become indigenous.

Relying upon these facts, I said, almost from the first of my lecturing, The time will come when Frenchmen will be acclimated in Algeria.

The event has justified me sooner than I hoped. Public documents this year, containing the quinquennial census, show, relatively to the preceding period, an increase of more than twenty-five thousand souls. But, what is more important, they establish that this increase is almost entirely due to the excess of births over deaths.

So that the sacrifices of the French in peopling Algeria already begin to bear fruit; and certainly the time will come when that country, conquered by our armies, will be, for the descendants of our first colonists, as salubrious as France is for ourselves. Then Algeria will truly be the France of the South.

But the sacrifices which accompany colonization are none the less sad, and it is often asked if there are no means of diminishing them. Unhappily, this is always difficult, often impossible.

However, here are two facts that I ask you to reflect upon:

Some of our colonies have the reputation of being particularly unhealthy, and it is said that in them manual labor is impossible for Europeans. The worst of these are on the western coast of Africa. Now, listen to the statement of Captain Bolot, commanding a company employed in the construction of a pier at Great Bassam, made to Captain Vallon, from whom I drew the fact: "A single Sunday put more men in the infirmary than three days of work under the hot sun." This is because the Sunday was given, not to work, but to debauchery.

Captain Vallon profited by the experience thus acquired. In his cruises to Gaboon he maintained on board his ship severe discipline and regular work. When not at sea, he made the sailors of the Dialmate work regularly in the full sun, but he forbade all excess, and in this way he preserved his own health and that of his crew.

I will give you another and much more important example, as it constitutes a true comparative experience.

It is another of the colonies I referred to as devouring Europeans. I mean the Isle of Bourbon, at the east of Madagascar, almost under the tropics—on one of the warmest points of the globe.

The tables of mortality of this island show a frightful excess of deaths over births. Judged alone by these tables, we must admit that the inferences drawn are perfectly justified. But these tables are true only when we take the population *en masse*. Now, the people composing it form naturally two parties. One includes the great proprietors, the great planters, the leading merchants, and all those who belong to them, who, so to speak, lead the life of colonists. It is to such, and to such alone, that the desolating figures referred to apply.

The other part of the population is composed of people

who till the ground with their hands, and who are disdainfully called by the name of poor whites. These are the descendants of the first colonists, who were all too poor to buy slaves, too proud to enter into the service of others, and who accepted for themselves and their posterity the life of small farmers. This last population keeps very much by itself; it has multiplied, and not only become prosperous, but its physical type has improved so much that travelers all speak of the personal beauty, both of the men and the women, of this race.

So, in this same Isle of Bourbon, the rich planters, and the working-men in cities, perish from the life of excess and debauchery, for which they are too much inclined in the colonies. The poor whites, who devote themselves to the cultivation of the earth, which is said to be impossible for the European under the tropics, have continued to develop, and have gained in all respects, because they have joined to moderate labor a sober life and pure manners.

Gentlemen, there is in this fact a practical lesson. Perhaps some among you will leave France; perhaps you will go to the colonies or to Algeria to seek your fortune! Let me impress upon you the history of the poor whites of the Isle of Bourbon—they have found that, to maintain health of the body, one of the best means, undoubtedly, is to preserve the health of the soul.

LECTURE III.

ON THE ORIGIN OF MAN.

GENTLEMEN: We meet in this hall, you know, to speak of man. I have already given two lectures here on the history of our species, and intend to give several more upon the same subject. You will not be surprised that the study of the human species, lightly as we may touch upon it, requires several lectures; for it includes all organic beings. Although man is superior not only to plants chained to the soil, but to all the animals that move upon the surface of the globe, yet, like plants and animals, he is a living organism. Hence he is subject to all the laws of organization and life. By his body he is an animal, nothing more, nothing less; and so he must obey all the laws of animality. For this reason, whenever a difficult question presents itself, which cannot be resolved by the direct study of man, we have recourse to indirect study. We then apply not only to the history of animals, but also to that of vegetables, to reach conclusions concerning man himself.

This is evidently the only scientific procedure; we have followed it so far, and we shall remain true to it.

Let us first glance at the questions already examined, and the answers given.

The first occupied an entire lecture. We asked if there was one or several species of men. Our conclusion was, that *the human species is single.* Comparative physiology

teaches that, in spite of the diversity presented by different human groups, everywhere men remain men, as dogs remain dogs; as cattle remain cattle; as horses remain horses; notwithstanding differences of figure, color, proportions, etc.

This question is fundamental; for, according to the answer given, we encounter in our path, or rather, we leave on one side, a certain number of other very important questions.

We devoted the second lecture to some of these questions, but we studied them more briefly.

We asked first, when man appeared on the earth. Guided by recent investigations, we replied to this question, which was *till lately regarded as insoluble.* We affirmed that man existed in France, in the neighborhood of Paris, at the same time with the elephant and the rhinoceros; and that, consequently, fossil man, whose existence was universally denied till within twelve or fifteen years, is a sure reality.

We then asked if the human species appeared simultaneously or successively on the different parts of the globe where it is found to-day. Always relying on the study of animals and vegetables, but appealing to geography and not to physiology, we concluded that he must have appeared *on a single point of the globe*—on a very circumscribed area, an inconsiderable space of the earth's surface.

We were able to go much further, and, without dwelling long on the proofs, we succeeded in determining with great probability the favored region where arose the human species, which was afterward to spread and dominate everywhere. We showed, according to all probability, that *the centre of human creation was toward the middle of Asia.*

As man appeared on a particular spot of the globe, and is to-day everywhere, having overrun the earth in all directions, he must have emigrated from his first country,

and traveled to those he inhabits at the present time. The partisans of the plurality of the human species, the polygenecists, have singularly exaggerated the difficulties of these emigrations, and have thus sought to make an argument against *monogenesis.* In reply we cited only the emigration of the Calmucks and the voyages of the Polynesians. These two examples suffice to show that emigrations, combining all the conditions that render success most difficult, have ended well even in our day.

Finally, in the immense journeyings of the human race, from its birthplace to all the other lands it now occupies, it has encountered all possible conditions of existence. It has had to become acclimated everywhere, among polar colds as well as in the burning winds of the tropics. We established the possibility of this acclimation of the race as well as of its emigrations. We then showed by examples that the difficulty was much exaggerated, and that, if all acclimation in a very different climate from that before occupied required sacrifices of individuals, and even of generations, it is not less true that, in a certain time, races the most different can be acclimated and prosper in the most opposite climates. Algeria furnishes a near and very striking example. But we cited others, and one of them enabled us to refer to a grave consideration too often overlooked—the influence of the moral health on the health of the body.

Such, gentlemen, are the points in the history of man that we have already examined.

To-day we enter upon a question put by the most uncultivated tribes, as well as the most civilized peoples; so profoundly does it concern the inmost nature of man. Whence came man? How did he come to be upon the earth? How happens it that during incalculable periods we find no trace of him on the globe, and at other epochs he is everywhere? This question, I repeat, has been pro-

Fig. 16.

Lady of Cairo (Egyptian).
White Race, Aramean Branch.

pounded in all times; it has occupied the most savage tribes and the most enlightened nations. It has always been answered in the name of dogma and religion; but this is a ground absolutely denied us, and we must look elsewhere.

Science has also put this question, and has tried to answer it with scientific data alone. Has it succeeded? I hesitate not to answer, No, it cannot, and I think you can easily understand why.

Let us distinctly state the case in all its breadth; for, here, as elsewhere, we cannot separate man from the rest of the organized and living creation.

The successive appearance of vegetables and animals, and of man, on the surface of the globe, is a fact. This is attested by geology. Thanks to this science, we have the right of affirming that at a certain epoch no organized being could live on the surface of the globe; that there came a time when the globe could be occupied by certain vegetables, by certain animals; that it afterward passed into a state which permitted the appearance of birds, of mammals, and then of man. What has produced this succession of appearances? Whence came the beings that sometimes suddenly appear where nothing seemed to exist before?

Again I say these questions are unanswerable, at least at the present time. We find these organized and living beings existing, and, if we see them multiply, it is always by the way of filiation. They always have a father and a mother. But who ever saw the first father and the first mother? We do not know by what process they were formed, or, if you like it better, what phenomena have preceded and accompanied their birth. The phenomena—the processes which support the existence of a soul, or even of a body—are very different from those which produced this soul or this body. The phenomena which led

to the appearance of animals and vegetables were very certainly any thing but those which sustain them.

This proposition is perhaps a little abstract, and some of you may not seize it at first. Let us take an example:

Without doubt, there are among you clock-makers, mechanics; in any case, whatever you are, you handle instruments of iron and steel. Well, you can understand that we may know perfectly the watch in our hands, may be capable of taking it to pieces to detect the slightest defect in the works, of cleaning it, of combining it again, and not know at all where the metal came from that enters into its composition, nor how the wheel-work was made. Nothing in the study of the watch indicates how the metals composing it were taken from the earth; how a material that once resembled stone was transformed into this something we call a metal. And, unless we have been employed in steel manufacture, we cannot know how iron is changed to steel, how it is made capable of receiving what we call temper. Consequently, the watch-maker, unless he has gone elsewhere for instruction, does not understand the manufacture of the mainspring which gives movement to the whole watch.

In the case of vegetables and animals, of organized beings in general, we are in the same position as the watch-maker who knows only watch-making. We can, to be sure, study plants, animals, and man, from the point of view of anatomy and physiology, can know the organs and give an account of the functions, but this study does not enlighten us concerning the origin of these complex and marvelous machines. We are in the position of the watch-maker who knows only his watches; and, unhappily, we have not yet found the school where we can go to learn the equivalent of what the watch-maker and mechanic can learn at the conservatory of arts and trades.

I repeat, nobody has yet seen the first appearing of any

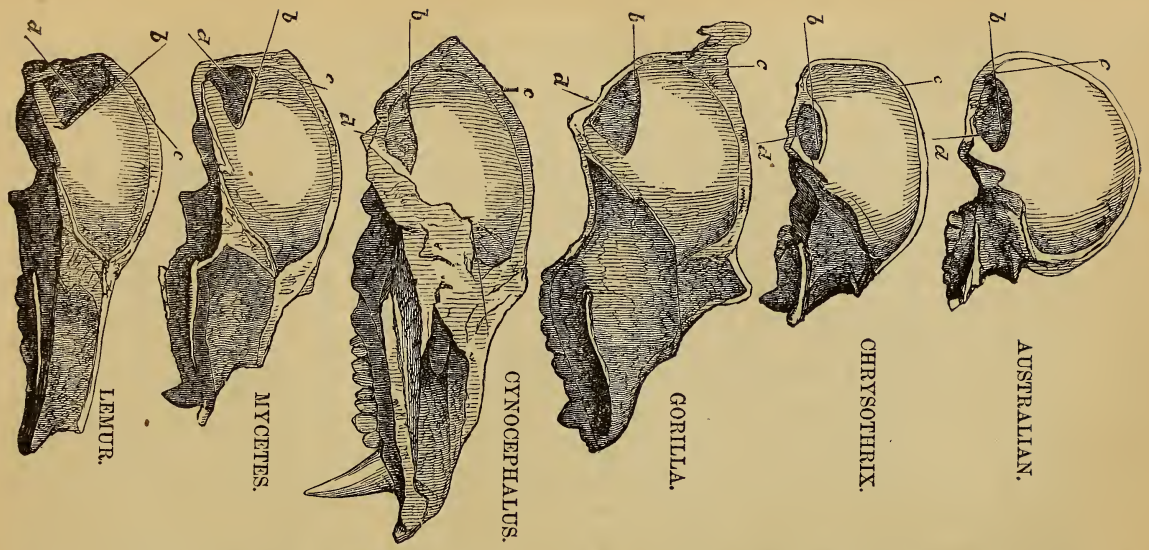


FIG. 17.—Sections of the skulls of Man and various Apes, drawn so as to give the cerebral cavity the same length in each case, thereby displaying the varying proportions of the facial bones. The line *b* indicates the plane of the tentorium, which separates the cerebrum from the cerebellum; *d*, the axis of the occipital outlet of the skull. The extent of the cerebral cavity behind *c*, which is a perpendicular erected on *b* at the point where the tentorium is attached posteriorly, indicates the degree to which the cerebrum overlaps the cerebellum—the space occupied by which is roughly indicated by the dark shading. In comparing these diagrams, it must be recollected, that figures on so small a scale as these simply exemplify the statements in the text, the proof of which is to be found in the objects themselves.

organized being whatever. Men of merit and undeniable good faith believe that they have produced organic beings complete in all their parts—microscopic vegetables, and animals. This is called *spontaneous generation.* But these experiments have failed whenever they have been repeated with proper precautions to prevent the introduction of germs which float constantly about us. More than ever we can say that this is so, for over and over again the question has been revived, and now it has come up again apparently supported by irrefutable proofs, and once more the errors of its defenders have been made manifest.

Let us own it, then, frankly, and without false shame; we yet know nothing of the way by which organic beings came to exist on the surface of the globe.

I am not afraid, gentlemen, thus to avow our incompetence. Mistrust the men who pretend to explain every thing: generally, they are the ones who know the least. You never find a true philosopher who hesitates to say, "I know not." At any rate, this is what I am obliged to say to you at this time.

So, gentlemen, science cannot say whence came man; but it can tell you whence he did not come. It is something that it can judge, and judge with certainty, of some of the hypotheses that have been put forth under the guise of science to explain our advent upon the globe.

These hypotheses are widely different from each other, but for the most part there is a general likeness among them, to wit: that man is nothing but a transformed and pefected animal; that he descended, by way of transformation, from animals that existed before him. In our day especially it is said, "Man is descended from the monkey."

You see this human head, and these heads of the species of monkey called *anthropomorphic* (Fig. 17); that is to say, monkeys in human form, because in certain respects

they approach very near us. You may yourselves judge, at a glance, that in all these instances, and taking account only of the most important part, the head, the transformations must have been at least very considerable.

Although this theory is reproduced to-day under diverse forms, it is any thing but new. For a long time men have wished to explain themselves by animals. We find the same idea even among many savage tribes. When they come to speak of their history, we shall find they claim to be descendants of bears, of beavers, etc., and some of them have also thought, of monkeys. Some have even seen in the orang a sort of brother, who preserves silence that he may not be compelled to work.

Among savages, traditions wrongly interpreted, and of which the true sense is lost, have given rise to these ideas. With us it is in the name of science that the descent of man from an animal species has been sustained. We find traces of this hypothesis in Greek philosophy, but it was not clearly formulated till quite recently. About the middle of the last century, in 1755, a Frenchman, De Maillet, published a work to show that all terrestrial and aërial animals came from transformed marine animals. He gave, as the ancestors of men, the tritons of the ancient fables, the mermen spoken of in the legends of the middle ages, and seemed even to wish to establish their filiation to fishes.

A little after the publication of the "*Telliamed*" of De Maillet, an Englishman, Lord Monboddo, a distinguished antiquary, published a curious book in many respects, on the origin of language, in which he attempted to show that civilized man is only the man of the woods (orang) perfected (1774).

In his "Zoological Philosophy" (1809), our great naturalist, Lamarck, maintained that all animals are derived from less complex animals by way of transformation; and,

especially, he tried to show how he could conceive that man had as ancestor some one of the highly-organized monkeys. It is this idea which is at the present time reproduced and upheld by new arguments drawn from the progress of science.

At bottom, this view of the origin of our species is but a particular application of a more complete and general doctrine which has been put forth in England by a naturalist of great ability, Mr. Charles Darwin. We must, therefore, say something of this doctrine. I will go over it as rapidly as possible.

Darwin, having to give account of the origin of species, supposes that originally there existed, so to speak, but a single organized being, which he calls an *archetype*. In consequence of the action exerted upon it by its conditions of existence, this type was modified more and more; and these successive modifications gave birth, by way of transformation, to all the animal and vegetable species that we find on the surface of the globe.

By a very simple illustration I will give you an idea of the way in which Darwin understands this transformation. Let us represent by a point the first type. For a time this type will give birth to beings which will more or less resemble it, will have nothing that will sharply distinguish them one from another. We may trace a white line to indicate this first interval. Then at a given moment, and under the influence of the particular conditions of existence in which they find themselves placed—under the empire of what Darwin calls the *struggle for existence* and *natural selection*—the characters of these beings change little by little; differences more and more marked appear and give rise to distinct groups that I will represent by two diverging lines, one red the other blue. In their turn these two secondary types will in the same way be more or less modified, will give rise to new distinct groups, that we can again

represent by lines diverging from the preceding ones. These lines, more and more multiplied and diverging in all directions, end by forming a kind of tree in which the last branches represent the beings, or the groups of beings which are most removed from the primitive *archetype.*

You will remark—and it is this which makes the theory of Darwin so seductive—you will remark, I say, that when a being has started in one direction it cannot take another. From the red type there can arise only secondary, tertiary, quaternary types, resembling more less the first parent. Take an example. Compare a part of our theoretic tree with what we see in zoological classification. A common type, the type of vertebrates, has given the four secondary types—fishes, reptiles, birds, and mammals—like the main branch which here gives off four secondary branches.

Now, in the same way that each of these branches gives off other branches, which again subdivide and ramify, so each of the classes that I have just named has its particular types which can never pass to one of a neighboring class. From a fish, according to Darwin there will never spring a mammal and *vice versa.*

Notwithstanding the device by which we have attempted to illustrate these abstract ideas, they are still, perhaps, a little difficult for some of you. I will try to make them plainer by a rough comparison which will serve to convey my thought.

You all know that great school which is one of the glories of France—the Polytechnic School. You know the pupils enter this institution on leaving the Lyceum, and after passing an examination. Here they all receive a certain number of general scientific notions. Their minds are given one impress; they are developed and enlarged; individual differences of course exist; but, upon the whole, taken *en masse*, they get the same degree of instruction, and instruction of the same nature. On leaving the school, what hap-

Fig. 18.

A Young Chinese.
Yellow Race, Chinese Family.

pens? Some pursue a military career, others civil careers, and, once entered on these careers, they are differentiated more and more in proportion to their progress.

Moreover, they never swerve from the course on which they enter. No matter how high they rise, they will not pass from one career to another. The pupil of the school of *Metz* will no longer coöperate with his old classmates of the school of *engineers*. On leaving the school of *Metz*, the officer of artillery and the officer of engineering will each follow his own special career. The first will be able, in some cases, to perform functions analogous to those of the civil engineer—to lay out roads and construct bridges; but, for all that, he will never become engineer-in-chief. The Polytechnician, entering the navy, may rise to the highest grades, he may become admiral; he will never become marshal of France.

That which is true of the Polytechnician in civil and political life, is true also of vegetables and animals in the matter of development, on the hypothesis of Darwin. It is this which makes Darwin's theory so popular, for it explains problems constantly put by naturalists, such as the relations of types, the characterization of groups, the analogies between them, the transitional types that link them together, etc.

But, while recognizing the convenience of this theory of the English philosopher, in the interpretation of a great number of facts, I am obliged to reject it because it is irreconcilable with other facts; but chiefly because it is in disaccord with the physiological laws of which I spoke in my first lecture upon the history of man.

However, since the attempt has been made to derive from the Darwinian hypothesis the conclusion that man descended from the monkey, let us see how this pretended filiation agrees with the theory of which they claim it is a consequence.

Before a theory which makes man descend from the monkey can be logically deduced from the ideas of Darwin, it must be admitted that the human type may be derived from the monkey type; that the first is, in fact, but the development of the second.

Now, in spite of superficial resemblances, which early led to the remark that the monkey is a caricature of man, there are, in the general plan of the two organizations, scientifically considered, profound differences. Man walks about on his feet, preserving the full liberty of his arms and hands; the monkey is made for climbing, and employs his four members for this purpose. In man, all the apparatus of locomotion, the feet, the legs, the thighs, the vertebral column, all the muscles that are attached to it, are modified to make an animal with two feet—a walker. In the monkey, on the contrary, all these parts are arranged and combined in a way to make an animal climber; the anterior members themselves, with all their dependencies, are appropriated to this purpose.

Now, the walker and the climber are two different types; to derive the one from the other is in formal opposition with the doctrine of Darwin.

This fundamental difference between the human type and the monkey type has been long known to science as true of the little monkeys, that could be easily procured. There has been a great desire to determine if it would hold equally in the monkeys that approach us more nearly, called the anthropomorphic monkeys. Extremely profound studies on this question have been made for many years and in many countries. The facilities now existing for procuring animals from far distant regions have enabled Mr. Richard Owen, the most distinguished anatomist of England, to make a serious study of this subject. M. Davernoy, the friend and colaborer with our great Cuvier, has made the complete anatomy of a gorilla. Later, an anatomist of whom

we regret the premature loss, M. Gratiolet, and Dr. Alex, have made a not less detailed anatomy of the chimpanzee. These two anatomists have given particular attention to this question. These men, having studied the monkeys that most nearly approach the human type, have shown that the adaptation of all the parts is not for walking, but for climbing, so that even among anthropoid apes the characteristic fundamental monkey type is most strikingly apparent.

So, although perfected in certain respects, the monkey does not change its nature. This fact agrees with the ideas of Darwin. Pushed to their utmost limit, faithfulness to these ideas leads us to say: Even when the monkey has by evolution become a being equal to man, this being will not be man. It will be a monkey as intelligent as we are, but it will not be a walker, it will be a climber.

It may be said, gentlemen, as I am not a Darwinist, that I falsify the doctrine, and draw inexact conclusions. But I have had the pleasure, this very year, of seeing one of the most reliable Darwinists, M. Charles Vogt, and he expresses himself on this question exactly as I have done. He also admits that, according to Darwin, man and the monkey could not arise from a common stock, but that the two types commenced to diverge, and were sharply separated before the appearance of the most inferior monkey; before the formation of those striated monkeys of which I here show you a specimen. This opinion, put forth by my eminent contemporary, in a special work, and repeated in full anthropological congress, has double authority. As M. Vogt is a zoologist, an earnest anatomist, he would know, although a Darwinist, that man could not have descended from the monkey.

Permit me to enlarge still further upon this question, and to show you that every thing leads to the same conclusion.

I have just glanced rapidly at the subject of adult man

and of adult monkeys. Take them now when they are in progress of development, and see what occurs in the

Fig. 19.

JAPANESE.
Yellow Race, Sinaic Branch.—Comprising the Chinese, the Japanese, and the Indo-Chinese Families.

brain during the period of life passed by either of them in the bosom of its mother. I scarcely need to remark upon

the importance of this study. The brain is incontestably, and, above all, from the point of view of development, the most interesting organ, whether of man or of the monkey. It is the seat of intelligence and of instinct. On this account all the world attributes the highest value to the characters furnished by it. Well, how does brain development proceed in the monkey and in man? Here, in a few words, I can show you an important fact.

The brain, contained in its bony case, is separated into diverse regions. Let us consider only two, the anterior or frontal lobe, and the median or temporal lobe. It is evident that in the case of animals, united by links of filiation, the succession of development in these two lobes ought to be the same. Well, between men and monkeys there is, in this respect, a complete difference. In man, it is the anterior lobe which begins to develop first, and is most promptly formed, the lateral or temporal lobe coming last. In the monkey, on the contrary, it is the temporal lobe which is developed first, and the anterior lobe which is developed afterward, so that, in the successive formation of the parts of this most important organ, there is a complete opposition.

It is evident that two beings that develop inversely, so to say, cannot be derived the one from the other.

This fact has great significance, not only by itself, but also in its consequences. It gives an answer to one of those vague assertions, too often employed by those who wish to establish the monkey as our ancestor. There exist human beings with very small skulls, and consequently with the brain equally reduced. Moreover, at the same time that the brain is diminished in volume, it is also simplified, and then it presents a certain resemblance to the brain of the anthropomorphic monkey when considered in the lump and without entering into details.

There has been no want of arguments from this resem-

blance. Some have wished to see in these facts a case of *atavism*, that is to say, a case of the reproduction of the characters of a very remote ancestor. It has been said that these individuals with rudimentary brains, which have been called microcephals, realize accidentally the form of brain of our first ancestors when they were detached from the family of monkeys.

Well, the researches of M. Gratiolet, on the mode and the succession of development of man and the monkeys, have shown that this pretended resemblance does not exist at all.* On the contrary, precisely by reason of the different manner in which the development proceeds when the human brain is arrested in its course, it is separated still further from the brain of the monkey. In this case the brain of man may sometimes be smaller and more simple than that of the monkey, but it does not resemble it for all that. In a word, although man may seem to fall below the beast by the imperfection of his organ of thought, he does not become an animal anatomically.

I understand, gentlemen, that this part of our subject is likely to give you some difficulty. Perhaps you have not always followed me step by step. However, you comprehend, I think, how deep and conclusive are the arguments opposed to the theory that we are descended from the monkeys.

The conviction becomes still more complete, if that is possible, when we examine with some care, and seriously compare with positive scientific data, the reasons on which it has been attempted to found this doctrine. We are then struck with the vagueness and partial verification of the facts or assertions almost always alleged by its partisans. Pretty much always they are reduced to simple possibilities. They say, Would it not be possible for the hand of man, by the transformation of such and such mus-

* *See* Appendix G.

cles, to come from that of the monkey? Is it not possible for a monkey, by dint of standing, to end by changing his posterior hands into true feet? Is it not possible that the same course should enable him to acquire calves, which are wanting in the monkey, and should have lengthened the bones, which are much shorter in the monkey, etc.?

Gentlemen, when we get upon the ground of possibility I know not where we shall stop. Every thing is possible except that which implies contradiction. Consequently we are no longer on the ground of science, which demands positive, precise facts. We are living in the land of romance.

I will add that in many cases these possibilities are opposed to the facts that transpire in our day, so that the reasoning comes to this: "But is it not possible that events took place in former times differently from those which happen to-day?" Serious science, gentlemen, cannot accept this mode of reasoning. It does not admit changes in the laws which rule this world—in those which touch organic beings, any more than in those which concern inorganic bodies.

There is but one argument which has been worked out in detail in such a manner that it can be taken and discussed point by point. It is the one drawn from a certain number of skulls discovered at greater or less depths in the soil, and which present somewhat exceptional characters. These skulls have been described with care and offered as presenting features intermediate beween the human cranium and that of the monkeys.

I can show you a model of the skull that has been most relied upon, and has acquired a real notoriety, under the name of the Neanderthal skull (Fig. 20). It was discovered in 1857 in the environs of Dusseldorf. This skull is chiefly distinguished from the human cranium by the very great prominence of the eyebrows. It is further characterized by its less height, by its length, and by some other particulars

FIG. 20.—The skull from the Neanderthal cavern. A. side, B. front, and C. top view. One half the natural size. The outlines from camera lucida drawings, one half the natural size, by Mr. Busk: the details from the cast and from Dr. Fuhlrott's photographs. *a* glabella; *b* occipital protuberance; *d* lambdoidal suture.

of which the description would take too much time. From its general form, and from the existence of two eyebrow swellings, it has been said that it is related to anthropomorphic monkeys and particularly to orangs. Gentlemen, you need only compare this Neanderthal skull with the crania of the orang and gorilla. Even at the distance where you are sitting, you can see that between the human head and the animal head there is an enormous difference, resulting from the volume of the cranium and consequently of the brain. The brain of the man to whom this cranium belonged would never remind us of that of the animal whose head I am now holding.

There are yet other points on which I believe I ought to dwell. To this Neanderthal skull has been given an exaggerated antiquity. It is said to be the most ancient skull that was ever found. This statement is, at least, very adventurous. It has been said that it resembles no other cranium. This is an error easily exposed.

As to the antiquity of this famous head, it was found in a cavern situated on the bank of a small river where the soil presents no characters which enable us to fix its precise geological age. So that to assign to this cranium an antiquity superior to that of the men of whom I spoke in a preceding lecture, an existence anterior to the men in France who, with stone weapons, combated the rhinoceros and the mammoth, is a supposition purely gratuitous. And, mark you, Mr. Lyell, the famous English geologist, who has written a volume to demonstrate the antiquity of man, was the first to express his serious doubts as to the age of this cranium. I repeat, the geological conditions in which it was found do not enable us to fix its precise date; but nothing in the whole case authorizes us to consider the cavern in which it was found as more ancient than the geological formation which contained the bones of Aurignac or Moulin-Quignon.

Be this as it may, the statement that this cranium resembles no other is an error (Fig. 21). From the first, when the designs and moulds of the Neanderthal skull spread over England, English anthropologists, strong partisans of the antiquity of man, did not hesitate to say that they had found in their country skulls that much resembled this one. Later, it was clearly demonstrated that its general form was no other than that of the Celtic skull. It is unwise to lay stress upon the frontal protuberance, on the flattening and elongation of the skull. Here is a smaller head which presents the same characters. You can even see that the frontal prominences, uniting at the centre, resemble still more that of the orang-outang than those of the Neanderthal skull. Now, this skull is that of an idiot who died some years since in a hospital of Paris.

Finally, gentlemen, we have proofs of another nature. The owner of the Neanderthal skull, M. Docteur Fullrott, made moulds of the interior of this cranium, and it is easy to see that the brain of which we have here the imperfect reproduction is that of a man belonging without doubt to a savage race, but who has not less the essential human characters.

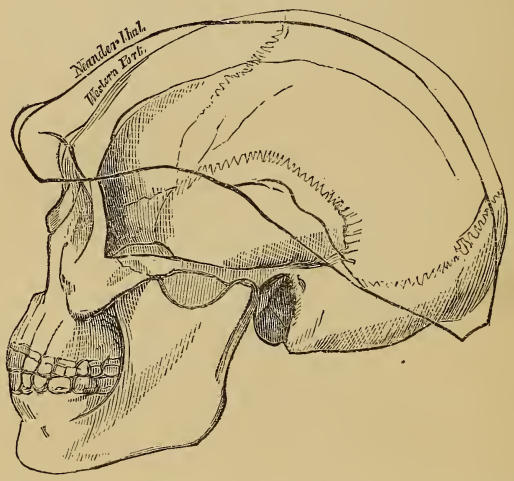
Once more: M. Bruner-Bey, whose works on these questions are of great importance, has made a cast of the interior of a cranium found in a tumulus of Poitou, and he shows that this mould, taken from an individual of indisputable Celtic origin, adapts itself perfectly to the interior of the Neanderthal skull. So that it is not only in the exterior form of the head that the man of Neanderthal resembles the Celt, but also in the brain.

The demonstration appears to me complete, and we have no hesitation in recognizing in the so-called *pithecoide* (relative of the monkey) a truly human cranium, and, what is more, a Celtic cranium. The enlarged arch of the eyebrows is no objection to this conclusion; for this fact is

reproduced in our day, as I have just shown, and as was also shown by examples at the congress of anthropologists.

To sum up: the theory that man is descended from the monkey, by means of successive modifications, is in reality

Fig. 21.



An Australian Skull from Western Port, in the Museum of the Royal College of Surgeons, with the Contour of the Neanderthal Skull. Both reduced to one-third the Natural Size.

only a brilliant fancy which has no support in precise facts; in most cases it depends upon possibilities and often upon possibilities in flagrant opposition to facts.

This theory, I hesitate not to say, is without support from any source; but especially, and mark me well, it is in absolute contradiction to the theory of Darwin.

I have dwelt upon the question because it has made around us a great noise. The idea of giving us the monkey as our ancestor is impressive, because it is new to certain persons, though already ancient; it is impressive by the species of liberty of thought that it seems to imply. Hence

it has become as it were popular, and probably you have already heard it spoken of many times. Another cause of the notoriety it has acquired is, that it has been sustained in the name of philosophy and combated in the name of theology, reappearing consequently in the grand current of controversy that often carries men of good judgment away from the ground where they ought to stand.

As for us, gentleman, we do not pretend to be either theologians or philosophers. We are exclusively men of science; we have, then, to disturb us, only the truths of science. It is in the name of these truths that I have had to recognize the weakness of science, to say, Whence comes man? but, in the name of scientific truth, I can affirm that we have had for ancestor neither a gorilla nor an orang-outang nor a chimpanzee; any more than a seal or a fish, or any other animal whatever.*

* *See* Appendix H.

LECTURE IV.

PHYSICAL CHARACTERS OF THE HUMAN RACES.

GENTLEMEN: I have already given you three lectures on the history of man. They have all been devoted to the examination of general questions, the solution of which can alone throw light on the study of the human races, and guide us in the midst of the thousands of facts of detail it involves.

These three lectures constitute the first part of the collection of facts and ideas that I have undertaken to expound to you. In them, you know, I considered man in his relation to the universe and to the earth he inhabits. We found that there exists only one species of man; that this species, much more ancient than was formerly believed, was the contemporary of the elephant and rhinoceros on the soil of France. Although spread everywhere at present, the human species, like other organic and living beings, had its special centre of creation. It must have appeared at first on a particular and circumscribed part of the globe, situated probably in the centre of Asia. Our earth, then, was peopled by migration. In the varied journeyings performed to reach all points of his domain, man has encountered thousands of conditions of existence. He has accommodated himself to them all—in other words, he has become acclimated everywhere.

There is another question we had to meet, because it

was seriously put to us, but, to answer which, we had to confess the insufficiency of present knowledge: it is the question of the first origin of man. Our answer to this question was founded on science alone. I have made this declaration many times; I repeat it every time I speak before a new audience. For the most part, the problems we have considered are treated by theologians and philosophers. I am simply a man of science, and it is in the name of comparative physiology, of botanical and zoological geography, of geology and paleontology, in the name of the laws which govern man as well as animals and plants, that I have always spoken.

To-day, however, I shall not need to recur, as much as in preceding lectures, to these terms of comparison. We have to commence the study of man considered in himself; and, in the first place, to account in a general way for the modifications presented by the human type.

These modifications constitute the *characters* which serve to distinguish divers groups of men—the different human races. Before studying these races in detail, we must fix somewhat the extent and the meaning of these characters.

To give order even to the brief study of the characters of the human race, it is necessary to separate them into a certain number of groups. This division is easily made, because of the multiple nature of man, which at the same time connects him with the rest of creation, and gives him a position apart.

Like all organic and living beings, man has a body. This body will furnish a first class of characters—the physical characters. Like animals, man is endowed with instinct and intelligence. Though infinitely more developed in him, these characters are not changed in their fundamental nature. They appear in the various human groups in phenomena, sometimes very different, as in the case of the languages. The differences of manifestation of this

intelligence will constitute the second class of characters—the intellectual characters.

Finally, it is established that man has two grand faculties, of which we find not even a trace among animals. He alone has the moral sentiment of good and of evil; he alone believes in a future existence succeeding this actual life; he alone believes in beings superior to himself, that he has never seen, and that are capable of influencing his life for good or evil.

In other words, man alone is endowed with morality and religion. These two faculties are revealed by his acts, by his institutions, by facts that differ from one group to another, from one race to another. From these is drawn a third class of characters—*the moral and religious characters.*

Let us attend to-day to the physical characters, to those furnished by the body.

In man, as in animals, the body is made up of *organs.* We can not only study the exterior of the body, but we can also penetrate the interior and discover its anatomy. Indeed, this is the only means of finding out its most important organs. In this study we can stop with the form, the arrangement, or we can go further, and seek to understand the actions of the parts, the *functions* they perform. We thus pass from anatomy to *physiology.* But these functions may be disturbed by many maladies that cannot be neglected, and which are the province of *pathology.*

In our present study, we must not neglect any of these orders of facts. You see how we are led to draw, from the body alone, four categories of characters, namely: I. Exterior characters; II. Anatomic characters; III. Physiological characters; IV. Pathological characters.

PHYSICAL CHARACTERS.

I. Exterior Characters.—When we see men or animals, the first thing that strikes us is their size. Our do-

mestic species are made of great and small races, and it is the same with man.

The extreme dimensions of the human form, whether great or small, have been very much exaggerated. Everywhere there has been a belief in the existence of races of

FIG. 22.

PATAGONIAN.
Red Race, Southern Branch, Pampean Family.

dwarfs and races of giants. For instance, the Greeks believed in the existence of a people, called by them pigmies, whose country they placed sometimes in one direction, sometimes in another, but always beyond the limits of the world they truly knew. These were little men about four-

teen inches in height, who, it was believed, were obliged to pluck down the corn with strokes of the axe, and who passed a part of their time defending themselves against the cranes. In the last century this fable of the pigmies was, so to speak, renewed and applied to the kymos, who were said to inhabit Madagascar. It is needless to add that, since we have seen them more closely, pigmies and kymos have disappeared.

The fables relative to giants are the contrary of the preceding. Among these fables there are some modern ones, for a time believed to be founded on real observation. The first voyagers who doubled Cape Horn found there the Patagonians, whose dimensions they singularly exaggerated. Pigafetta, the companion of Magellan in the first voyage around the world (1520), pretended that he and his companions scarcely reached to the height of their waists. One of his successors, Jofre Loaysa, with still greater extravagance, declared that the heads of the Christians reached only to the upper part of their thighs. This was, you see, to attribute to these people a height of thirteen to sixteen feet.

Time and science have done justice to these fables and exaggerations. Let us see what are in reality the extremes presented by the human stature.

It is plain that in this research we must leave out exceptional individuals, of which we see a certain number in the fairs and museums, or anywhere, for money. It is a question neither of General Tom Thumb, whom you have perhaps met sometimes in the Champs Elysées, nor of the French or Chinese giants, recently exhibited in Paris. I will only remark, in passing, that these individual exceptions appear among all nations, although more rarely, perhaps, in the midst of savage populations.

The smallest known race is that of the Bushman, which inhabits the southern part of Africa; the greatest is the

Patagonian, of which we just named the country. An English traveller, Barrow, measured all the inhabitants of a tribe of the first; a French traveller, Alcide d'Orbigny, took the exact measure of a great number of individuals belonging to the second of these two extreme races.

It results from these measurements that the mean height of the Bushman is four feet three and one half inches, and that of the Patagonian five feet eight inches. The mean difference between the greatest and the smallest human race is then sixteen and one-half inches.

The smallest Bushman measured by Barrow was a woman who was only three feet ten and one-half inches. The largest Patagonian measured by D'Orbigny attained six feet three inches. The greatest difference existing, then, between normal human individuals is two feet eight and one-half inches. The ratio between the extremes of height just named is nearly as 1 to 0.6. These figures signify much and lead to important consequences.

First, the difference in size among our domestic animals is much greater than that above indicated. From the great dogs that promenade in our court-yards, down to certain dogs which have figured at dog-shows, the ratio is 1 to 0.3. The difference is also as great between the large brewers' horses of London and horses from Shetland, which are sometimes not larger than a Newfoundland dog. These horses and these dogs are, however, only different races of a single species. One cannot reason, then, from differences of height to sustain the multiplicity of human species.

There is another consideration not less important:

From all the data I can gather, it results that the mean stature of men, the world over, is about five feet three inches. But this mean, like that given above, results from very numerous and very diverse heights. If in thought we place all men in one line according to their

height, it is easy to see that we should obtain a series in which the difference from one to the next will not be, perhaps, the $\frac{1}{2500}$th of an inch.

But this is not all. In this graduated series, the men of the same race will be far from being placed together. There will be in this respect the strangest mixture. All the Patagonians are not nearly six feet three inches in height, nor all the Bushmen as short as three feet ten and a half inches. Among our cuirassiers and the hundred guards of the emperor many individuals would be found with the first; the Lapps of the north of Europe and the Mincopees of the isles of Andaman in the Gulf of Bengal would mix with the second.

Now, in no other kind of animal, with numerous species and of limited growth, is there any thing parallel. The domestic races alone present something like its analogue. So that, by themselves, these considerations drawn from the height furnish excellent proof of the unity of the human species.

The study of proportions would show us like facts and conduct to similar conclusions. But I leave considerations of this kind, to pass to other characters almost as striking as those of height. I wish to speak of those drawn from the complexion, and first of all from the color of the skin. The general coloration of the body is a well-defined character; but we need not exaggerate its value.

If you observe several portraits representing individuals of the white race, you may see that their tint is sometimes as dark as that of the Guinea negro. In the portrait of Rammohun-Roy, the celebrated Brahman reformer, the fineness and regularity of his profile attest that he is of the purest Aryan blood, and his color is that of a negro just a little blanched. Again, there are Abyssinians whose features recall the fine Semitic type, and yet few negroes surpass them in blackness. So all black men are not negroes.

Fig. 23.

A Fellah Woman and Children (Egyptian).
White Race, Aramean Branch, Libyan Family.

Reciprocally, Livingstone has found in the centre of Africa negroes of the color of *café au lait.*

The color of the human race varies from white, such as is seen in Dutch and Danish women, to violet or yellow, to yellow-citron or smoke, to copper-red or brick. By appealing to your recollections, you can establish a series passing from light to dark by insensible shades such as could scarcely be reproduced upon the palette of a painter.

Recollect that some of these extremes of color are frequent among domestic animals, and are sometimes much greater. With black hens, it is not the skin alone that is colored. All the great interior membranes, the sheaths of the muscles, the aponeuroses, as well as the flesh of the wings, present an aspect very little appetizing. So it is sought to weed them out of the poultry-yard; and still in certain parts of the globe they are constantly produced and would evidently soon become a race if left to multiply. Here, again, in the case of animals, the difference from race to race is much greater than in the case of man.

Sometimes, in the presence of variations of color like these we have described, we ask if, between the negro and the white, there do not exist anatomical differences in the skin? The minute study of this organ answers us in the negative.

The skin is composed of three layers, which together constitute a true organ having its proper functions. So it is often called the *cutaneous organ.* On the exterior is the *epidermis*, that dry and insensible layer which covers the entire body, and protects it against the action of outer agents.

Interiorly, and immediately above the fatty layer, is the true skin—it is the essential and living part of the cutaneous organ; it is this which receives the blood-vessels and nerves.

Between the true skin and the epidermis is a dark lay-

er, composed of distinct cells. It is the mucous membrane of Malpighi, so named from the anatomist who first described it. The cells that form it are a simple secretion of the true skin. It is this layer which is the seat of color. It exists in all men, but the cells that it contains are more or less colored according to race. In whites themselves, in certain parts of the body, around the nipples, in the specks of freckles, in the beauty-spots, etc., we sometimes see them as deep as in the negro.

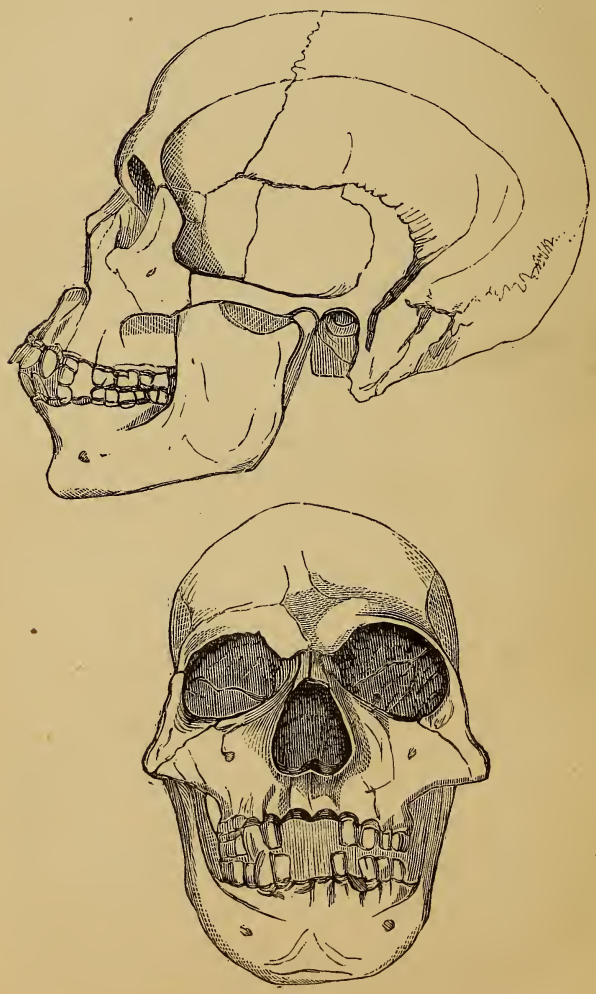
You see that the color in different human races is, when developed, only a phenomenon of local coloration, of exactly the same nature as that encountered in races of domestic animals. If time permitted me to enter more fully into the subject, I could make this fact much more evident, but the hour advances and I must hasten.

To the skin are attached a certain number of organs which may be considered as adjuncts. These are chiefly the villosities or hairs, the sebaceous glands, and the sweat-glands. Between these annexed organs, there exists a certain balance which physiology easily explains. So in glabrous races, that is, races with little or no villosities on the body, the sebaceous apparatus is much more developed. This fact is very marked in the African negro, whose skin sometimes bears slight prominences, sketching a sort of arabesque by the extraordinary development of these little organs.

It is to the development of the sebaceous apparatus that the odor of the negro is due. This odor is so strong, so persistent, that it suffices to the identification of a negro-ship a long time after it has left the trade. But it is not negroes alone that are characterized by malodorous exhalations. It is the same with the whites themselves. You all know that a dog follows his master by the scent. Savage people, whose senses are more exercised than ours, distinguish very quickly the general odor which char-

acterizes a race; and, in Peru, they give special names to that of the white and of the black as well as to their own.

Fig. 24.



Oblong and Prognathous Skull of a Negro; Side and Front Views, one-third of the Natural Size.

As to the hair which may be seen on different parts of the body, a special mention is due to that of the head. All people have more or less hair on the head, and this gives also very good characters. Among these the most essential are drawn from the form presented by the transverse cut when examined under the microscope. In the yellow people, the Americans and the white allophyles, this cut is more or less circular. In the Aryans, of which we are a part, it is oval; in the negroes it takes the form of an elongated ellipse. It is evident that a circular cut indicates a cylindrical hair. Such hair is very coarse and stiff, and never curling or frizzled; an oval cut indicates a slight and regular flattening. In this form the hairs are finer, and may be made into curls or waves more or less marked. Finally, the elliptical cut can only appear when the hair is much flattened, almost like a thick ribbon. These are the finest, and these alone have the aspect of wool which characterizes the head of the negro.

Crosses between these different races sometimes produce very remarkable heads of hair. The negro crossed with the Brazilian produces the Cafuso, whose hair, forming an immense wig, is at the same time long, stiff, and kinked.

I would further enlarge upon these exterior characters, as being the ones of which we can most easily give account, but time fails me, and I pass to the second class of physical characters, to those which we must seek in the interior.

II. Anatomic Characters.—The anatomic characters may be drawn from the solid parts of the body, that is, the skeleton, from the soft parts, and even from the liquids. I shall at first confine myself particularly to those displayed by the head.

In the head itself we must distinguish the cranium from the face. The first incloses the brain, whence proceed the organs of sense, with the exception of those of touch, prop-

erly speaking. Above all, it is the seat of intelligence; on these various accounts it merits a separate examination.

The general form of the cranium, that is, the relation between the longitudinal and transverse diameters, furnishes an excellent character. When this relation is less than that of 100 to 78, the cranium is considered as elongated from front to back: it is *dolichocephalic.* When the relation varies from 100 to 78 or 80, the cranium is medium or average; we say it is *mesocephalic.* Finally, when the relation is from 100 to 80, and above, the cranium is considered short, and is said to be *brachycephalic.*

These forms sometimes characterize very large human groups. So almost all the negroes are dolichocephalic; nearly all the yellow people, and most of the Americans, are brachycephalic or mesocephalic. Among the whites, and even sometimes in two populations belonging to the same branch of the white race, we find the two extremes. The Germans of the north are dolichocephalic, the Germans of the south brachycephalic.

While recognizing the importance of the characters drawn from these general forms, we must guard ourselves against exaggerating their import or giving them a wrong signification. Some authors, belonging to the dolichocephalic races, have pretended that the elongation of the head behind is a sign of intellectual superiority. The fact I have just stated suffices to refute this conclusion, and nothing justifies it. The Germans of the south are noways inferior to their countrymen of the north. In the Academy of Sciences in Paris, the brachycephalic crania, or at most the mesocephalic, are in very great majority; and still, what association of men is superior, in an intellectual point of view, to this philosophical body?

Analogous indications have been drawn from the greater or less capacity of the cranium. It has been supposed that this exactly corresponded in measure to the

volume of the brain, and this volume has been regarded as a sort of measure of intellectual power.

That there is some truth at the bottom of the idea that a brain sufficiently developed is necessary to give the power to fulfill its functions, is what all the world admits. But that intellectual power is measured by the quantity of cerebral matter entering into the composition of the organ is in contradiction to the observations and the figures of many anatomists, among others, of R. Wagner.

In considerations of this nature we do not generally take account of the stature. Now, although the head does not enlarge in the same proportion as the rest of the body, it is not the less true that the body influences its dimensions.

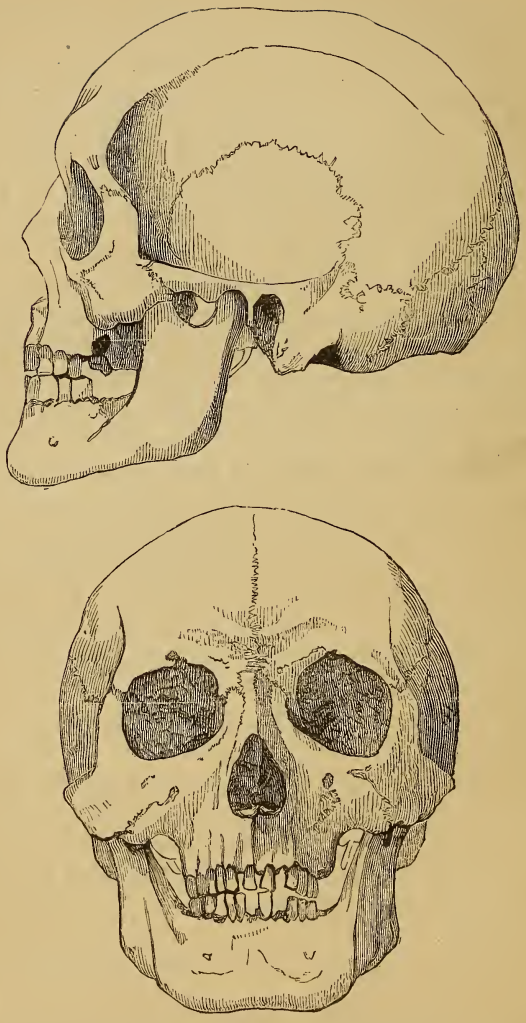
Besides, with organized and living beings, the volume, the mass of organs, is not all. Their special energy is much more. Certainly you all know small persons, of slender aspect, who are more active and strong than some of their comrades who are larger and more muscular. Well, how is it that what is true of flesh, of muscle, is not also true of brain?

After the cranium we come to the face. But I will only speak of a single order of characters drawn from the jaws and teeth.

Observe a negro, and a European. Look at the jaws and teeth of the first. You see them project in front. In the second, on the contrary, teeth and jaws are equally vertical. The first of these is called *prognathism* (Fig. 24), and the peoples or individuals who present them are said to be prognathous; the second (Fig. 25) takes the name of orthognathism and characterizes the orthognathous races or individuals.

Prognathism has long been considered as characterizing the negro races. Since, we have found it in people who could not be affiliated with the negro; and, finally, looking closely into the matter, we have found it in the heart of

Fig. 25.



Side and Front Views of the Round and Orthognathous Skull of a Calmuck, after Von Baer. One-third the Natural Size.

white populations. At Paris, even, it is frequent enough, particularly among women. This is a fact of which you can convince yourself, as I have often done during my rides in the omnibus.

Judging by the crania that we possess, prognathism is characteristic of a population incontestably European which lives at the south of the Baltic, the Esthonians. This people is, furthermore, the remains of the most ancient race of Western Europe. It is this race, without doubt, which, mixing its blood with new-comers, has left in the midst of our great cities those indications of a prognathous race to which I have just referred.

After studying the cranium and face separately, we must examine the head in its *ensemble*. From this, also, we draw important characters. I will only mention one, which has a certain real value, but the signification of which some have exaggerated and falsified.

Camper, an anatomist of Holland, studied comparatively the Greek and Roman medallions and statues, and, struck with the air of majesty presented by the Greeks, gave for a reason that the *facial angle* was greater than in the Romans (Fig. 26). This angle is formed by two lines which meet at the extremity of the front teeth, and of which one passes by the middle of the orifice of the ear, while the second is tangent to the forehead.

Pushing these researches much further, Camper believed that he discovered a regular decrease of the facial angle in the human race. Going further, and applying it to animals, he placed in a descending scale, man, monkeys, carnivora, birds, all characterized by smaller and smaller angles. Whence, to conclude that the facial angle measures, so to say, the intelligence, is but a step, which was taken without hesitation.

As this conclusion gives great interest to the measurement of the facial angle, many processes and many instru-

ments have been proposed to obtain it with all possible exactitude. The *goniometer*, invented by my assistant M. Docteur Jacquart, attained this end better than any other.

Jacquart did not stop with making this instrument. He used it; and, in a beautiful work, he shows among other things that the right angle exists in the white race, contrary to what Camper believed; that we do observe it, in intelligent persons, who are, however, not sensibily superior to others with a lesser angle. The facial angle cannot, then, be considered as measuring the intelligence, the reach of the mind.

M. Jacquart shows, besides, that, in the population of Paris, the angular differences of which we are speaking are much more considerable than those that Camper regarded as characterizing races. He shows that here, again, there is from race to race that entanglement of traits which I have so many times pointed out. Yet here, as elsewhere, the average furnishes good characters to determine human groups.

Again, the skeleton presents important characters. We ought, at least, to examine the breast, the pelvis, the bones of the limbs, etc.; but we must leave this subject, to say a word on the soft parts.

Regarded in the two extremes of humanity, the white European and the negro, the nervous system presents a fact which it is important to point out. With the first, the nervous centres—the brain and spinal cord—are relatively more voluminous. In the second, on the contrary, it is the expansions from the centres—the nerves—which are more voluminous.

The circulatory apparatus presents a balance somewhat analogous. With the white, the arterial apparatus, which carries the blood to the organs, is relatively more developed than the venous apparatus that draws the blood toward the heart.

Fig. 26.

Greeks of Athens.
White Race, European Branch, Greek Family.

The blood of the negro, studied in his native country, is more viscous and darker colored than that of the white. That of the creole negro of New Orleans is, on the contrary, paler and more aqueous, and recalls the blood of the anæmic. So, a simple change of habitat sometimes modifies a human race in this most profound character—in this liquid pabulum destined to penetrate and nourish all parts of the body.

III. Physiological Characters.—I shall dwell briefly on the physiological characters, and only point out two general facts, of which you will easily see the importance.

As regards all the great periods of life and all the great functions, there is a nearly complete identity among all men, to whatever race they belong.

When this resemblance is not apparent, the cause is not in the nature of the races, but in the influence of conditions of existence. This is well proved by the fact that races the most widely separated resemble each other completely when they are exposed to identical conditions through a change of habitat. So, the precocity of the negro has been cited as distinguishing this race from European nations; but, when white people live for generations in hot countries, they take on the same peculiarity. The negress and the English creole of the isles of the Gulf of Mexico are just alike in precocity.

On the contrary, the study of secondary functions shows that they vary from one group to another, and sometimes very widely. But, then, also, we see that the environment, the manners, the habits, etc., are the cause of these variations; and, again, we see races the most unlike come to resemble each other so much as to be confounded. There are hunters of English and French descent who have their senses of sight and hearing as quick and sharp as the red-skins.

In conclusion, the study of physiological characters strongly attests the fundamental unity of the human race, by throwing light on the marvelous flexibility of our organism.

Fig. 27.

Indian of the Mexican Coast (Aztecs).
Red Race, Northern Branch, Southern Family.

IV. Pathological Characters.—The study of diseases presents entirely similar facts, and conducts to the same conclusions.

All the human races are accessible to the same diseases. If any circumstances—isolation, for instance—have preserved some one of them from affections common to the others, a simple coming together suffices for the propagation of the disease. The eruptive maladies seem to have been implanted in America by the Europeans; but, once implanted among the indigenous races, they have raged

with a violence unknown to us—a violence which is accounted for by the kind of life led by these people.

Yet immunities, at least relative, have been proved. For instance, the negro race is much less sensible to the emanations of marshes, to the miasms from stagnant waters, than the white race. On the other hand, it is much more easily affected by phthisis.

Other more complete immunities have been observed, and some have even wished, in consequence, to justify the admission of a distinct human species. But these immunities, even the best marked, disappear with time, especially under the influence of conditions of existence. I will give you a curious example:

Elephantiasis is a hideous malady, peculiar to certain warm countries, which swells and deforms, sometimes in the strangest way, the parts of the body it attacks. In one of the Antilles, in Barbadoes, this disease was seen from the first among the negroes, but had constantly spared the whites till 1704. That year a white person was seized, and since then the malady has extended in this race; but it never attacks any but creoles. Up to the present time, Europeans, who settle in this isle, enjoy the ancient immunity. You see it is only a question of complete acclimation.

Gentlemen, I believe I have sketched, in this one lecture, a body of facts and ideas which, at the museum, occupied at least ten lectures, each as long as this to-day. So, you see how many things I have been compelled to omit. Incomplete as is this presentation, it is sufficient, I think, to establish clearly some general facts, and prepares the way for an important conclusion.

You have seen that, considering man from the point of view of his height and color, we may form a graduated series which passes from one extreme to the other by insensible gradations. You have seen further that, in this

series, groups the most distinct by other characters—the most separated by their habitat—are found intermixed.

Permit me to add that we should get the same result, whatever the exterior or anatomical character upon which we establish our series.

The study of functions, whether performed in a normal manner, in a state of health, or under the perturbing influence of disease, shows us identical fundamental facts revealing the unity of human nature.

Even apparent exceptions come under the general facts when we take account of the influence of the environment which, as you have seen, effaces some of the most marked differences.

In this examination of the physical man, every thing leads to the conclusion which we had already reached in our earlier lectures; and we can repeat with redoubled certainty: the differences among human groups are characters of race, and not of species; there exists only one human species; and, consequently, all men are brothers—all ought to be treated as such, whatever the origin, the blood, the color, the race.

Gentlemen, the lectures I have given here require a special preparation, and are not always easy to prepare; but I shall not regret either my time or my pains, if I am able, in the name of science, and that alone, to render a little more clear and precise for you this great and sacred notion of the brotherhood of man.

LECTURE V.

INTELLECTUAL AND MORAL CHARACTERS OF THE HUMAN RACE.

GENTLEMEN: I resume my discourse for the fifth time on the same subject. You have already, on four different occasions, studied man; and, again, man is the subject of this lecture.

On the preceding occasions I ran over some of the general questions that arise concerning the history of the human race. Depending always and exclusively upon science, I have shown that this species is unique; that all men are of the same species; and that, in consequence of this fact, they ought to regard each other as brothers, whatever the color of the skin, whatever language they speak, whatever country they inhabit.

This species at first occupied a very limited part of the earth. It spread all over the globe at an earlier epoch than was formerly believed; more recent researches have demonstrated that man existed in France along with the hyena, the elephant, the rhinoceros—that is to say, along with animals seen, in our day, only in distant countries.

As man appeared at first on a restricted point of the globe, and is found to-day everywhere, it is evident that he has traveled in all directions from his *centre of creation*, and peopled the earth by migration much as do the Europeans at the present time. These journeyings have exposed him to all the influences which can be encountered on the

surface of our planet, and he has become acclimated everywhere as we see him to-day.

In the study of general questions relative to the history of our species, we had to ask what was the origin of man.

On this point I have been obliged to confess the insufficiency of actual knowledge. But, if I was not able to say whence man came, I could say, in the name of science, whence he did not come; I could affirm that our ancestor was not an animal—neither a monkey, nor a seal, nor any other animal whatever.

At our last meeting we commenced the study of the general characters presented by the human species, and we examined its *physical characters;* that is, those which may be drawn from the body studied in a state of health and of disease. We were led also to pass in review its exterior characters, its anatomic characters, physiological and pathological. We thus obtained an idea of the general nature of man, considered exclusively from an organic point of view. Well, this study of man, in his material relations, led us to the conclusion that there is but one human species, so that it confirmed the results at which we arrived in our first lectures.

But is the body all of man? And, after studying the material being that strikes our senses, is there nothing more to study? Science will answer.

When a naturalist studies ants, he is not content with describing the thorax, the abdomen, the jaws and the legs. He shows also how they construct their ant-hill, and to what use its chambers are destined; its galleries, where so many and such divers things are stored; he shows, further, how they raise their larvæ and their young ones; how they hold in captivity the plant-lice destined to furnish an aliment which they secrete, as do the cows and sheep we keep in our stables.

When a naturalist gives the history of bees, he does not

limit himself to a description of their body and wings; he is careful to show how they build their hives, gather and knead the wax to construct the comb in which they deposit honey, the first sweet known to man. He calls the attention of the reader or listener to that unique female, always alone in each hive; he shows the respect and care that all the bee-workers have for this female, who is at once their queen and their mother.

In other words, the naturalist studies the instincts of the ants and the bees.

When he attempts the history of man, shall he put aside that which in him represents these instincts? Evidently not.

Consequently he must not stop with the body. He must consider the intelligence which is in us, and which, up to a certain point, we have in common with animals; he must show that it is this element of our being which recognizes the outer world, which judges, which aspires. His work will be very imperfect, if he neglects this something of which the nature escapes us, but of which the power is such, that through it man has not only vanquished all animals, whatever their defenses, their size, or their strength, but he has overcome and made to work, as his servants, even the immutable forces of the inanimate world, achieving all distances, thanks to the railroad! outstripping time, thanks to the telegraph! and even annihilating pain, thanks to chloroform!

Then, along with the material characters which we studied at our last lecture, we now take up intellectual characters.

It is our distinct intention, in taking up characters of a nature so new, still to remain exclusively on the ground of science.

We know the existence of faculties, and we shall point out their most general manifestations; but we shall have

no concern with the nature of these faculties. In a word, we are not philosophers. Here, as in preceding lectures, we shall remain a man of science—a naturalist, and nothing else.

It will be impossible for me to examine these characters in detail. I shall neglect several, and limit myself to saying something on language, on writing, on the fundamental forms of society, on industry, and on dress.

I. *Language.*—It will not be denied that the most essential of all the manifestations of intelligence is language.

"Animals have voice, man alone has speech." This phrase is from an ancient philosophic naturalist—from the great Aristotle, who lived some four centuries before our era; it is as true to-day as it was more than two thousand years ago. In fact, man alone possesses articulate speech.

But, you all know that the manifestations of speech vary from people to people. Each of these manifestations —the languages, as we call them—constitutes one of the most essential characters of the different human groups. You all know a German, a Spaniard, an Englishman, by his language. But this is not the limit of the scientific importance of this character. Unhappily, I cannot here enter into details. I shall only attempt to show you, in a few words, how the study of language throws light on the history of human groups, even in the case of those who have lost all historic data.

You know that in France other languages than French are spoken, and that, on all sides of us, we find the Gascon in the south, the bas-Breton in Brittany, the Alsatian in Alsace, etc. Whence comes this diversity of language among a people at present so remarkably homogeneous?

History answers this question. It teaches us that, until a certain epoch, Languedoc, Alsace, Brittany, formed so many separate states, having each its own language. From this fact we are enabled to draw important consequences.

When we encounter a group actually designated by a single name, and when we find in this group secondary groups speaking diverse languages, we may almost to a certainty conclude that formerly all these secondary groups had their individual life, their political independence.

The study of language conducts us still further.

When, in place of mere juxtaposition, each remaining in the place it has occupied for an indefinite time, the different nations, from any cause whatever, come to be mixed together, they each bring their language; and, in consequence of the fusion, each brings his part of the language, that becomes common. A language so formed is a mixed language, which consists of words and turns of phrases recalling the mother-languages which gave it birth.

Here, again, history shows us that this thing has actually been done. The English language, for example, has words and expressions which bring to mind the languages of all the races that have been mixed and confounded in that island.

Consequently, when we enter for the first time a country of which we know not the history, and find a population presenting in its language words and phrases borrowed from other languages, on the right and on the left, we are authorized to conclude that this population results from the mixture of anthropological elements, which imply the linguistic elements themselves.

We may go still further.

Language, you know, changes—is transformed with time. The French language of our day is not the French of five centuries ago; the Frenchman of to-day must study specially and with dictionaries before he can read the French of the past.

So, language changes, even when there has been no displacement of population. And all the more when immigration intervenes; if mixtures occur, the language will

be altered, and a new language will arise. This new language may differ so much from the primitive one as to appear at first to have no resemblance to it. This may happen not only for one people and for one language, but for many. A language may also become the mother of many different languages. But these daughter languages always preserve something in common with that from which they descended; and men who have made these questions the object of continued study, the linguists, know very well how to discover the filiation. They know how to rise from derivative languages to their primitive tongues. In this way they attach together people that were thought to be very distinct because they spoke languages that at first seemed very different.

It is by this study, wholly recent, but which for some years has advanced with the stride of a giant, that we are able to unite in one source most of the people who now cover almost the whole of Europe; such as, on the one hand, the French, the Germans, the Swedes, and the Spaniards; and, on the other, the people who inhabit Persia and the valley of the Ganges. These people constitute what is called the Aryan race.

More marvelous still, thanks to the comparison of languages, a philosopher of Geneva, M. Adolph Pictet, was able to trace a sort of history of the primitive Aryans, the common parents of Europeans, Persians, and Indians. He retraced their manner of life, and, although they left no historical data, he has shown almost in detail the point of civilization at which they had arrived.

I cannot, you know, enter into details relative to this science, at once so recent and already so immense that it has been called comparative linguistic science. I can only indicate the great divisions, because, perhaps I shall, by-and-by, have to refer to them.

All the languages spoken on the surface of the earth

have been divided into three fundamental groups; these are the *monosyllabic languages*, the *agglutinative languages*, and the *flexible languages*.

The monosyllabic languages are the most imperfect. Each of their words consists of one syllable. As an example, I will name the Chinese, which is a monosyllabic language, *par excellence*. In this language each word presents itself with a sense perfectly absolute, and the delicacies of our language, even the distinctions of time, of place, of going, of coming, etc., can be translated only by a kind of paraphrase.

The agglutinative tongues form the second stage of language; here there are words, placed after the fundamental conception, which serve to modify the primitive sense—roots, to employ the expression in use. As examples of agglutinative languages, I will name the negro languages, and those spoken by yellow people, and also by very small numbers of white people.

Finally, the highest development of language is that of flexible language, so named because, by simple changes in the termination of a word, we can change and modify the absolute sense, and make it express divers shades of meaning, thus: *je parle* (*I speak*) now; *je parlerai* (*I shall speak*) to-morrow. Almost all the white races speak flexible languages.

II. *Writing.*—Speech is evidently the first element in the formation of societies; writing is the most essential element of the progress of these societies. It is speech *fixed*. This alone permits the transmission of the results of our efforts to the most distant descendants—of the accumulation of the treasures that each generation has separately acquired. I should like to dwell upon its history; but I should be drawn too far, and so, for writing as for language, I can only indicate a few facts.

Almost with the lowest savages we find means to aid

the memory, and serve as *souvenirs* of events to which more or less importance is attached. These are called *mnemonic* signs. They are sometimes stones, sometimes pieces of

FIG. 28.

INDIAN BARK-LETTER.

FIG. 29

INDIAN BARK-LETTER.

EXPLANATION OF FIG. 28.—On one occasion a party of explorers, with two Indian guides, saw one morning, just as they were about to start, a pole stuck in the direction they were going, and holding at the top a piece of bark, covered with drawings, which were intended for the information of any other Indians who might pass that way. This is represented in Fig. 28. No. 1 represents the subaltern officer in command of the party. He is drawn with a sword, to denote his rank. No. 2 denotes the secretary. He is represented as holding a book, the Indians having understood him to be an attorney. No. 3 represents the geologist, appropriately indicated by a hammer. Nos. 4 and 5 are *attachés*; No. 6 the interpreter. The group of figures marked 9 represents seven infantry soldiers, each of whom, as shown in group No. 10, was armed with a musket. No. 15 denotes that they had a separate fire, and constituted a separate mess. Nos. 7 and 8 represent the two Chippewa guides. These are the only human figures drawn without the distinguishing symbol of a hat. This was the characteristic seized on by them, and generally employed by the Indians, to distinguish the *red* from the *white* race. Nos. 11 and 12 represent a prairie hen and a green tortoise, which constituted the sum of the preceding day's chase, and were eaten at the encampment. The inclination of the pole was designed to show the course pursued; and there were three hacks in it below the scroll of bark, to indicate the estimated length of this part of the journey, computing from water to water.

EXPLANATION OF FIG. 29.—This figure gives the biography of Wingemund, a noted chief of the Delawares. No. 1 shows that he belonged to the oldest branch of the tribe, which had the tortoise on their symbol. No. 2 is his *totem*, or symbol; No. 3 is the sun, and the ten strokes represent ten war-parties in which he was engaged. Those figures on the left represent the captives which he made in each of his excursions, the men being distinguished from the women, and the captives being denoted by having heads, while a man without his head is of course a dead man. The central figures represent three forts which he attacked; No. 8, one on Lake Erie; No. 9, that of Detroit; and No. 10, Fort Pitt, at the junction of the Alleghany and the Monongahela. The sloping strokes denote the number of his followers.

wood shaped in divers ways. A mode of appeal to the memory, found in both the Old and the New World, consists in uniting packages of strings of different colors, on which are made knots of divers forms. These are called *quippus*. You make, so to speak, a quippu every time you tie a knot in your handkerchief to enable you to recall something.

Picturing objects, men, events, in a more or less faithful manner, is not writing; it is what is called *pictography*. Such are those gross representations employed even to-day by the Indians of North America to transmit information (Figs. 28 and 29).

When the object figured has a conventional signification, we may say that writing has begun. For example, the idea of prudence would be represented by a serpent, that of force by a lion. This manner of translating thought is symbolic, ideographic writing. It presents many stages. The hieroglyphics seen on Egyptian and Mexican monuments belong here. But all these signs do not constitute veritable writing.

In reality, this appears only when the signs employed represent the sounds of the language. After reaching this point, writing again presents two very different stages. Each syllable may have its particular character; or, better still, the elements of the syllable may be represented. This last form constitutes writing, properly speaking. It is this that we employ. The collection of signs we call an alphabet; and this alphabet, which constitutes the first step of elementary instruction, is certainly one of the most marvelous inventions of the human mind. So almost all the ancients attributed to it a divine origin.

III. *Primitive Forms of Society.*—As I just said to you, it is by language that societies begin, and by writing that they make the greatest progress in civilization. But, before they attain civilization, they have long halting-places

to get over, and, regarding the human races in their *ensemble*, we see three very distinct kinds of primitive society.

The lowest degree of human association is people that hunt and fish; and this inferiority is easily explained. A society composed entirely of hunters cannot be numerous, because it must live on the game it kills. Therefore, a great space is needed to nourish a sparse population. Besides, the hunter's chances are for the day; he is never sure of a living for to-morrow. This incessant uncertainty prevents him from directing his intelligence toward more elevated subjects. Hunters, besides, have incessantly to watch their hunting-grounds to prevent encroachments. In other words, the hunter is the image of war. Wars easily arise between neighboring populations placed in identical conditions. These wars are without mercy, for each prisoner is one more mouth to feed; kill him, then. Hence, hunting-tribes are almost inevitably courageous, sometimes heroic, but warlike and cruel.

As soon as man domesticates certain animals—cattle, sheep, or llamas—as soon as he becomes pastoral, his to-morrow is assured. He can at once begin to occupy himself with something besides his food; and we see societies of this kind begin to make progress. However, pastoral people need vast spaces for their animals; these promptly exhaust the herbage of a canton; it becomes needful to go elsewhere after food for the animals which supply milk and flesh, the nourishment of the master, and so a pastoral population cannot exist in great numbers. They easily become nomadic. In their migrations the hordes meet and dispute by force of arms for the precious pasturage. War breaks them up; but prisoners may be utilized by the conqueror, and their food will not be a great sacrifice. They are spared, and slavery is born.

Society takes its third form, when man finds that the vegetable kingdom furnishes more abundant and reliable

food than that obtained from animals—when he becomes an agriculturist. Besides, agriculture gives him leisure. His manners soften. War, when it breaks out, becomes less cruel. Prisoners employed to work in the field can render services more and more considerable. Slavery becomes serfdom. Relieved from imperious material necessities, the intelligence of the master awakens and enlarges. A true civilization may arise and grow among agriculturists.

Fig. 30.

Centuries ago Europeans attained a social state permitting the degree of civilization of which we are so proud, and this leads me to make an observation.

Too often, under the influence of our actual superiority, we disdain the people who are behind, whether in the pas-

toral state or in the state of hunters. We proclaim them incapable of reaching our level.

This opinion is nowhere justified. Forget not that we have passed by the same halting-places. Forget not, above all, that many civilizations have preceded our own. Two thousand years before our era the Chinese raised monuments that still excite the admiration of travelers, cultivated the mulberry, raised the silk-worm, and possessed notions of astronomy. Egyptian civilization is still more ancient. You saw proof of this at the Universal Exposition. In the temple raised under the direction of N. Mariette you must have admired, among other things, that magnificent statue of Chefren placed at the bottom of the hall, and which dates four thousand years before our era. At this time we were true savages, covered with the skins of beasts, and carrying on our persons, under the pretext of embellishing ourselves, paints and tattooing like those of the most backward races of our own day. The effect of this should be, on the one hand, to awaken our modesty, and on the other to render us indulgent to people who are yet at the point which we have escaped.

IV. *Industries.*—It is in the midst of primitive societies that industries are born and flourish. However low a people may be, it always has its own proper industries. Man is essentially an industrious being.

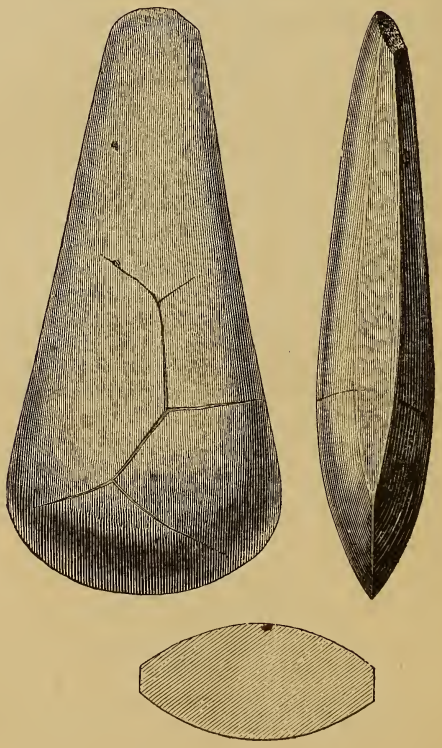
All industries suppose utensils; and the matter of which these utensils are made furnishes the means of determining to a certain extent the degree of civilization attained by people whom we know only by traces they have left.

In the beginning we see stone alone used to fabricate utensils and weapons; for these two things proceed together. Everywhere, man is at first content to shape more or less perfectly matter furnished him by the soil. Look at these samples of stones (Fig. 30) which have served as hatchets, whether for domestic use or war. You

see they are fashioned very simply. These objects came from our soil; they served our first ancestors, and attest the truth I have just stated.

In proportion as man's progresses, he is not content simply to shape the stone; he polishes it. His first at-

Fig. 31.



tempts in this way are coarse enough. At first the edge of the hatchet alone is polished; later the entire hatchet, and sometimes in a remarkable manner (Fig. 31).

The hatchets as well as the knives are generally of silex, that is, of that species of stone which formerly served as flint in striking fire. Its hardness explains why it was chosen for these purposes. When it began to fail they could employ others. Finally, they fell back on shells, and it is impossible not to admire some of their works executed with such imperfect instruments, with fragments of stone less hard than our silex, and the *débris* of marine shells. After stone appeared the metals; but not iron, of which we know so well the uses and which alone has made possible the miracles of our modern industry. Copper and bronze preceded iron; in America copper, in Europe bronze, came after stone.

Fig. 32.

Boomerang.

Finally, iron made its appearance, and many evidences prove that from its first discovery its value was understood. In the gymnastic plays celebrated by Achilles on the tomb of his friend Patroclus, at the epoch of the Trojan War, twelve centuries before our era, a mass of iron is proposed as a prize, and Achilles himself speaks of its importance.

The diversity of material employed in utensils marks the true stages in the history of ancient peoples. At this time we generally admit as distinct periods the age of stone, the age of bronze, the age of iron. The age of stone is divided into two periods, according as

the utensils and weapons were polished or only shaped. It is to this most ancient period that the population belonged which lived in Europe with the elephant and rhinoceros.

I must refer you to the special history of the several races for further details of their industries. But I will add a few facts to the preceding. Let us speak a word about the warlike industries.

Wherever human society exists, we find instruments of war. After the need of food, it seems the most pressing want of man is to kill or enslave his kind. We may say that man is a warlike being.

Among the lowest people of the globe we find offensive and defensive arms; and everywhere those at the bottom of the scale astonish us by the ingenuity of these arms. The Australians, certainly a most inferior people, use a not very large but very thick shield. Their skill in parrying strokes is most remarkable, as all travelers admit. The same people use curious weapons; one, called the *boomerang* (Fig. 32), is a bit of hard wood, very flat, sharp, and more or less curved. The inhabitants know how to throw this little piece of wood so that, after it has struck the enemy or the game, it rises in the air, turns, and falls into the hand of the thrower. The boomerang realizes, then, the enchanted arms spoken of in the old fables—arms which, after having struck the mark, come back themselves to their possessor.

V. *Dress.*—If I point out some facts relative to dress, it is to show you how much of connection, of real resemblance, there is between the most savage and the most civilized people.

Everywhere and always man has sought to embellish himself; sometimes by acting on himself, sometimes by borrowing the elements of his dress from without. In the tombs discovered from time to time which inclose the remains of men with their stone hatchets, used in

France against the elephant and rhinoceros, in those tombs, I say, we find collars (Fig. 33) made of morsels of shells or small corals which had not, in the eyes of their possessors, a less value than the precious stones have for us. We might almost define man as a being who ornaments himself; and certainly here is a great difference separating him from the animals. I shall not dwell on the different

Fig. 33.

Necklace.

materials taken from the exterior world to cover our bodies and embellish us. Were you to see a woman of Tahiti in grand costume, you would remark that when our grandmothers had contrived the panniers, and the women of our day the crinoline, they only borrowed from the children of the South Sea a part of their attire.

It is worthy of attention that, under the pretext of embellishing himself, man has almost always sought to modify his own body. So the Chinese women, in order to make their feet very small, cripple themselves in so grave a manner that often the little children succumb in the operation. The bones of the heel, in place of elongating behind, are violently displaced and directed downward, so that the women walk on their own heels as on the heels

of their shoes. The toes are likewise turned under, the big-toe alone being in place. Our women do not go so far; but you know women who, to make the feet small, fear not to give themselves corns, and many men do the same.

At the Philippines, the group of isles that you see at the east of Asia, is a people whose women attach great importance to having the largest possible fist. To make it large, they swaddle the arms, which consequently remain slender, while the fist enlarges in a fashion very repulsive to our European eyes.

But the head seems to have been, by preference, the object of these strange caprices, probably because it is the part of the body most evident and most important. Some people seek to change completely the form of the cranium. For this purpose they place on the heads of children, immediately after birth, contrivances which project them forward or backward, and then, by pressing tightly behind and before, the head is made flat. There is a people on the western side of America which surrounds the head of the infant with a bandage so as to give it the form of a sugar-loaf.

I must remind you that among ourselves the ears are still pierced to suspend ornaments from them. If men have generally renounced this fashion, women remain very faithful to it. But all the other parts of the visage have been submitted to the same mutilations, the nose, the lips, the cheeks themselves have been pierced, always to suspend or introduce into the openings some morsel of wood, of stone, of bone, as ornament.

The face and the forehead are frequently decorated with divers tattooings (Figs. 34 and 35), made sometimes by pricking, and sometimes by cutting the skin. At the Marquesas Isles, not only the countenance, but the entire body s tattooed. You see here the figure of a man (Fig. 36)

and perhaps you think him covered with a motley costume; no, it is simply tattooing.

Jest not too much at these ornaments of savages. Our ancestors wore the same, and the fashion is not wholly effaced with us. More than one of you, doubtless, has on the arm or on the breast some red or blue figure representing a heart pierced, two swords crossed, an anchor, or a hammer, symbols of your profession.

Fig. 34.

Head of New-Zealander.

Fig. 35.

Head of New-Zealander.

Along with these tattooings incrusted in the skin by various processes, we may place also the paintings. Here, again, is a means of embellishing that every people has practised and practises still. Sometimes these paintings have precise significations; there are the paintings of war, the paintings of peace, the paintings of *fêtes*, etc. We do not go so far; but we must not forget that the most civilized Europeans have painted and still paint the counte-

nance. Our grandmothers habitually used white, and, above all, red; they put on patches, that is to say, small rounds of court-plaster, to give beauty to the skin by con-

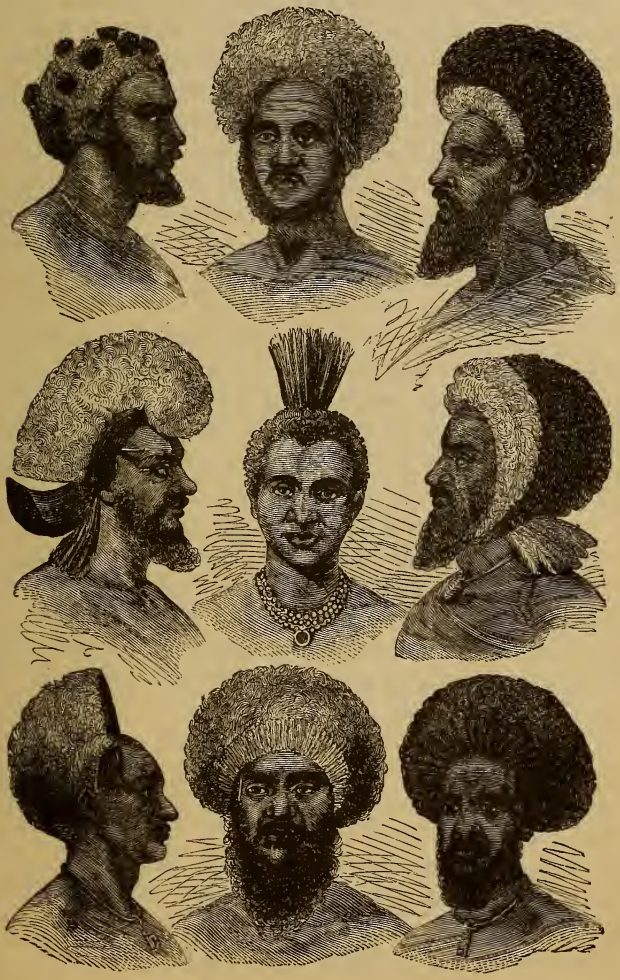
Fig. 36.

Caroline-Islander.

trast. And to-day, you know, our fashionable women tint themselves so well that a word has been invented on this

subject. So we find, in our most elevated classes, that which seems so strange in savages.

Fig. 37.



Fijian Modes of dressing the Hair.

The head of hair offers the same considerations. With savages as with us, it is an object of no less special care. Negroes, Hottentots, Polynesians, etc., stiffen their hair with grease, and color it with powders, red, yellow, white, etc. (Fig. 37). Everywhere they decorate it with flowers, feathers of all sorts, brilliant crystals, grains of glass. Well, our fathers pomaded and powdered themselves; our women pomade themselves, and put flowers, feathers, and diamonds, in their hair, which are, after all, only crystals, more or less dear. And as to our pomades, whatever name we give them, they always have, for foundation, the oil of almonds, or the fat of pork. You see that, between the article used by savages and that we make ourselves, there is no great difference.

III. *Moral and Religious Characters.* — We pass to another order of characters. By his body, I repeat, man is an animal, nothing more, nothing less; by his intelligence he is infinitely superior to animals. But, to judge by fundamental phenomena, the nature of our intelligence does not differ from that which they manifest.

Are we, then, only a more intelligent kind of animal? I have already answered this question. No; we are not animals, we are something else; for, besides the phenomena which we have in common with them, we have our special character, connected with faculties, of which we find not the least trace in the most elevated animals. These faculties are *morality* and *religion.*

I. *Morality.*—Among all people, in all races, there are expressions which mean good and bad, honest man and scoundrel; consequently, all men have the abstract notion of good and evil.

Objections have been made to this idea that morality is an attribute of man; or, rather, difficulties have been raised on the subject. Some say, for example, that animals also know what is good and what is bad. This is true for

our most perfect domestic animals, as the dog. Thanks to our superior intelligence, we have accustomed them to that which is good and bad *for us*. But leave them in a savage state, and you will never find them doing any thing to which you can attach the notion here implied. Man is certainly the only being that we see war against pain—physical evil—that he may reach moral good.

It has been said again that morals differ from people to people, and the attempt has been made to draw from this an inference that morality is not characteristic of man. The faculty itself is here confounded with its manifestations. We forget that the same sentiment can be expressed by very different and sometimes opposite acts. I will take, for example, those which testify to politeness and the respect we pay to superiors. In the same case, the European rises and uncovers his head; the Turk, on the contrary, remains with the head covered, and the Polynesian sits. These contrary acts are not less, the one than the other, acts of deference.

We must place ourselves at this point of view to judge of morality. We must, in such cases, and, above all, when it is a question of inferior peoples, forget our own notions on this subject, and seek after the general ideas of the people we are studying. We must recur to what has taken place with us at certain epochs, and then we shall find that there is not as much difference as we imagined between the most civilized and the most savage people. We shall return to the subject in treating the history of races. To-day I can only say a few words relative to three chief principles: *Respect for property, respect for the life of others, and respect for one's self.*

I. *Respect for Property.*—It has been said that the notion of property does not exist among savage people. This is an error. With them, arms, utensils, instruments, are strictly personal property, as with us; but some travel-

ers have been deceived by the existence, among hunting-tribes, of another kind of property, communal property, if I may so speak. Among these people the ground does not belong to the individual, but to the entire tribe. Under this relation the property is so well known that war is the consequence of the least violation of the hunting-limits.

Certain races have been accused of being essentially thievish. This reproach is brought particularly upon the negroes of the Gulf of Guinea, and upon the Polynesians. They have been accused of stealing even the nails of the ship. But let me remind you what iron is for people who do not have it. It is more precious to them than gold. Well, suppose there should arrive among us a ship, gold clad and nailed with diamonds and rubies. Do you believe it would go out intact from our ports? Remark further, that, among the negroes of Guinea and Polynesia, those who steal of their comrade are dishonored and punished as they would be with us. They have the idea of respect for property the same as ourselves.

II. *Respect for Life.* — Everywhere the life of man is sacred; everywhere the murderer is punished; but, with ourselves, circumstances determine the nature of the act. Nobody would treat as an assassin him who beats fairly in a duel; the soldier who has killed with his hand a great number of enemies is decorated; very far from being punished, he is recompensed. With savages the formula is still more elastic. For him the stranger is always an enemy; besides, vengeance is in his eyes a virtue, and when he has a murder to avenge he cares little to strike the murderer himself. Provided he punishes a member of his family or his tribe, his vengeance is satisfied; whence results the *bad blood* between European travelers and the Polynesians in particular. These people have too often complained of violence exercised by Europeans, who have left without being punished. The savage watches for those

who come after the really guilty, sets a trap for them, and massacres the innocents. He applies his moral law, and we find the theory horrible. But forget not our middle age; we have got the start a little, but, in our day, if the *vendetta* were not abolished in Corsica, it would be the same, as it was the same in Scotland between clan and clan.

For the rest, gentlemen, the question of respect for the life of others is one of those that I least like to enter upon, because I cannot speak without blushing for the white race. You know that it rules everywhere, but some of you do not know, perhaps, that everywhere devastation and massacre have marked its steps round the world. It seems that it has used its superiority to annihilate its sister races, and reign on their tombs.

III. *Respect for Self.*—I have shown you that the evils of which we accuse the savages exist with us. Permit me to show you among them the good of which civilized people pretend to have the monopoly. The sentiments of honor and of modesty are certainly two of the most noble and most delicate of the respect due to one's self. We find these two sentiments developed sometimes in a high degree in the most savage peoples.

It is evident that the idea of modesty must vary from one region to another; it cannot be the same among people forced by the climate to go naked, and among those who are compelled, by the rigors of climate, to wear clothes. We ought, in this respect, to look for marked differences, and to take account of these exigencies; besides, from the nature of the subject, I cannot enter into details, and I will only say that more than one traveler has expressed his astonishment to find more of true modesty among naked savages than among civilized and well-clothed people.

Honor is, perhaps, the sentiment which is most uniformly manifested among these people. To obey the sense of honor, they hesitate not to provoke torments; to brave,

and even to solicit, death. A young Kaffre chief is condemned to death; he may be pardoned on the condition of losing his ostrich-feather, which for him represents epaulets; he demands, as a favor, to be thrown to the crocodiles rather than be dishonored. The red-skin made a prisoner, bound to the post of torture, defies his enemies to extract from him the least sign of suffering.

That which we call chivalric generosity exists among the most savage peoples. Two Irishmen quarreled one day with some Australians; they were without arms. Instead of profiting by this advantage, the savages gave them arms that they might defend themselves.

In our war at Tahiti, Admiral Bruet, commander of the French forces, took a bath one day in a river of the interior of the isle, while a well-armed chief belonging to the enemy was concealed near by. When peace was gained, this chief came to see the admiral, and easily showed him that for nearly two hours his life had been in his power. "Why did you not draw?" said the admiral. "I should have been dishonored in the eyes of my people," replied the native, "if I had killed by surprise a chief such as thou."

See how the people called savages often conduct themselves. Would we do better?

You see, gentlemen, and you may fearlessly say, to the honor of our species, that morality, in its more serious as well as in its more delicate aspects, is found among all men; and, decisively, man is a moral being.

II. *Religion.*—I come now to another order of considerations, that it will perhaps surprise you to hear me discuss. I have said, at different times, that I wished to remain a man of science, that I did not wish to enter here upon either philosophy or theology, and yet I am going to speak of religion. I shall continue faithful to my programme. It is as a naturalist that I shall take up the subject. As for morality, I showed the existence of the faculty: then I

pointed out some general facts, reserving the special facts for the history of races. To-day, as heretofore, I shall avoid with care the dogmatic and the theologic side of the discussion.

The first fact to establish is the universality of the manifestations which belong to religion. In every country, with all peoples, in all races, we find the belief in beings superior to man, and influencing his destiny for good or evil. Everywhere we find the belief in another life succeeding to the actual life. These two notions lie at the foundation of all religions, and whoever admits them is religious. We can say, then, of man generally, that he is certainly religious.

Objections have been made to the generality of this character. Let us rapidly examine the case.

Some authors affirm that there exist atheistic people. They have cited in proof the Australians of whom I have already spoken, and Bushmen. These are mistaken assertions; but this error may be explained. Three causes, acting together or separately, have contributed to a misunderstanding of the religious beliefs of the inferior races of humanity.

The first is the belief of travelers. When these travelers are missionaries, having an ardent faith but a narrow intelligence, they are easily led not to accept, as true, religious beliefs so different from their own. Often, in their eyes, these beliefs are a work of the devil; they put them aside, or do not take the trouble to discover them, and they offer us, as atheistic, people who certainly are not.

Ignorance of the language often leads to regarding a people as atheistic. A traveler encounters a savage tribe; he puts questions, well or ill, often by signs alone, on the Deity, or on the soul; the natives do not understand, and reply by some gesture of negation, and the traveler concludes that they believe neither in God nor immortality.

But, the great cause which has often led to the conclusion I am opposing, is the disdain of Europeans for savages. Generally, the European, proud of his knowledge, and overrating his superiority, judges in advance their incapacity to attain to notions a little elevated. He takes no great pains to discover what he believes does not exist. At the first failure he thinks himself right in concluding that these inferior races are incapable of attaining to the notion of God and of a future life.

Happily there are some tolerant missionaries who have studied them more closely, and laymen who have been able to see brothers in these inferior representatives of the human family. Thanks to the intelligence of these patient, clear-headed men, we now know that these Australians, that were said to have no idea of God, have in reality a rudimentary mythology, which sometimes recalls our own European superstitions. We now know that the Bushmen deify their great men, and address prayers to them. These Bushmen have a remarkable idea of the Divinity. They regard him as a great chief, who resides in heaven. They say of him: "We see him not with the eyes; we feel him in the heart."

This last phrase, which I quote literally, was obtained by travelers who lived in the midst of these people. They show that sometimes the people justly placed in the lowest rank of the human races may have, along with the strangest superstitions, religious notions remarkably elevated. This fact is often presented when we examine the religion of different people. We find, it is true, much that is *bizarre*, many strange and shocking things, but we find also behind these absurdities ideas and beliefs which astonish us by their seriousness, by their elevation, by the resemblance they offer to that which is believed by more advanced people.

The negroes of Guinea may serve to illustrate this subject. All travelers have spoken of their absurd beliefs, all

have spoken of their fetiches. They tell us how these people prostrate themselves before serpents, trees, bits of wood, bone, etc., carefully wrapped up, and on which their priests have performed certain ceremonies. There are few who would seek that which might be found at the bottom of all this. Those who have made the search have found religious ideas, very superior to these appearances; the belief in divinities of different orders, living in the skies, and presided over by a sovereign creator who made every thing. When we look still further, as M. d'Avezac has done, we find prayers conceived in terms such as a European, a Christian, might repeat without blushing. In the case of these negroes, as in our own, we must distinguish between religion and superstition, two extremely different things, which are too often confounded. I will add but a few words.

Gentlemen, I close to-day the first part of the lectures that I have undertaken to give you. Let me formulate the last conclusions.

We have asked only general questions, those which bear on the entire human race, and which may consequently conduct us to the foundation of the nature of man. We have asked them exclusively from the point of view of natural science; we have studied man as we study an animal or a plant. The result of this examination is to show in man a *résumé* of the entire creation.

In him we find phenomena exactly parallel to those encountered in minerals, in plants; consequently, all the forces acting in minerals and plants we find in man.

By his body, from an anatomical and physical point of view, man is an animal, nothing more, nothing less; hence all the animal forces act in him.

But is it by his body that man has acquired that empire that we have seen he possesses? You know very well it is not; you know very well that, if he reigns over all

around him, over inanimate Nature as over organized Nature, he owes it to his intelligence, of like nature, but immensely superior to that of animals.

Finally, man has his own attributes—faculties that belong exclusively to him—morality and religion. Well, these exclusively human faculties seem admirably to complete this exceptional being. It is these that ennoble him, and justify the incontestable empire that he claims over the globe; for it is these which, along with the sentiment of punishment, give birth to the idea of duty, the thought of responsibility.

Here, gentlemen, is the summing up that one is led to make of man when he is studied exclusively from knowledge by the naturalist.

APPENDIX.

A.

Prof. Huxley, in his volume entitled "Evidence as to Man's Place in Nature," presents the other side of this question as follows: "Science has fulfilled her function when she has ascertained and enunciated truth; and, were these pages addressed to men of science only, I should now close this essay, knowing that my colleagues have learned to respect nothing but evidence, and to believe that their highest duty lies in submitting to it, however it may jar against their inclinations.

"But, desiring, as I do, to reach the wider circle of the intelligent public, it would be unworthy cowardice were I to ignore the repugnance with which the majority of my readers are likely to meet the conclusions to which the most careful and conscientious study, I have been able to give to this matter, has led me.

"On all sides I shall hear the cry: 'We are men and women, and not a mere better sort of apes, a little longer in the leg, more compact in the foot, and bigger in brain, than your brutal chimpanzees and gorillas. The power of knowledge, the consciousness of good and evil, the pitiful tenderness of human affections, raise us out of all real fellowship with the brutes, however closely they may seem to approximate us.'

"To this I can only reply that the exclamation would be more just and would have my own entire sympathy, if it were more relevant. But it is not I who seek to base man's dignity upon his great-toe, or insinuate that we are lost if an ape has an hippocampus minor. On the contrary, I have done my best to sweep away this vanity. I have endeavored to show that no absolute structural line of demarcation, wider than that between animals which immediately succeed us in the scale, can be drawn between the animal world and ourselves; and I may add the expression of my belief that the attempt to draw a physical distinction is equally futile, and that even the highest faculties of feeling and of intellect begin to germinate in lower forms of life. At the same time no one is more strongly convinced than I am of the vastness of the gulf between civilized man and the brutes; or is more certain that, whether *from* them or not, he is assuredly not *of* them. No one is less disposed to think lightly of the present dignity, or despairingly of the future hopes, of the only consciously intelligent denizen of this world.

"We are indeed told, by those who assume authority in these matters, that the two sets of opinions are incompatible, and that the belief in the unity of origin of man and brutes involves the brutalization and degradation of the former. But is this really so? Could not a sensible child confute, by obvious arguments, the shallow rhetoricians who would force this conclusion upon us? Is it indeed true that the poet, or the philosopher, or the artist, whose genius is the glory of his age, is degraded from his high estate by the undoubted historical probability, not to say certainty, that he is the direct descendant of some naked and bestial savage, whose intelligence was just sufficient to make him a little more cunning than the fox, and by so much more dangerous than the tiger? Or is he bound to howl and grovel on all-fours because of the wholly

unquestionable fact that he was once an egg, which no ordinary power of discrimination could distinguish from that of a dog? Or is the philanthropist, or the saint, to give up his endeavors to lead a noble life, because the simplest study of man's nature reveals, at its foundations, all the selfish passions and fierce appetites of the merest quadruped? Is mother-love vile because a hen shows it, or fidelity base because dogs possess it?

"The common-sense of the mass of mankind will answer these questions without a moment's hesitation. Healthy humanity, finding itself hard pressed to escape from real sin and degradation, will leave the brooding over speculative pollution to the cynics and the righteous 'overmuch' who, disagreeing in every thing else, unite in blind insensibility to the nobleness of the visible world, and in inability to appreciate the grandeur of the place man occupies therein.

"Nay, more, thoughtful men, once escaped from the blinding influences of traditional prejudice, will find, in the lowly stock whence man has sprung, the best evidence of the splendor of his capacities; and will discern, in his long progress through the past, a reasonable ground of faith in his attainment of a nobler future."

B.

It is probable that if M. Quatrefages had made the experiment of taking persons to a case wherein were jackals, wolves, and varieties of "dogs," from the Esquimaux to the greyhound, the bull-dog, and terriers (not labeled), he would have come to an entirely different conclusion. In fact, there is much less difference between the wolf and some dogs—e. g., Esquimaux and Spitz—than between them and some fancy breeds. The name (dog) indeed is a

quasi generic term connected with an assumption of common origin of the animals embraced thereunder; in other words, it is the expression of a preconceived idea which will not stand the test of analysis, or confronting with facts. So far are the propositions that dogs and wolves are different species from being true, that the eminent John Hunter, after a series of experiments on their mutual fertility, came to the conclusion that they (as well as the jackal) are of the same species, and M. Quatrefages, if obedient to his own criterion of specific determination, should have come to the same conclusion.

C.

On the contrary, not only have hares and rabbits frequently reproduced with each other (*see* Gindre, "Rapport à la Commission des Récompenses sur le Mémoire de M. Gayot relatif aux Léporides." Bulletin de la Société Impériale Zoologique d'Acclimatation, 1870, pp. 659–667), but with certain precautions they readily copulate and produce young, and these hybrids and their descendants are fertile among themselves, and the hybrids between the hare and the leporide are "fine and valuable animals for the table, growing quickly and attaining a greater size than the leporides. They are excellent for the market, and can be sent there when four months old. They have admirable health, beauty, and size" (*op. cit.*, 1873, p. 871).

D.

Our information respecting hybrids is too limited as yet to afford us a sufficiently large inductive basis for generalization, but it is at least certain that M. Quatrefages's

laws are altogether too general, and that, in fact, there are no such *laws*. In the cases especially referred to (the horse and the ass), we have representatives not only of different species but of different genera; and, although the hybrids of these, as a rule, are infertile, exceptionally they have reproduced with the parent-stock. In another case, however, where the representatives not only of different genera (*Bos* and *Bison*) were coupled, the hybrids were perfectly fruitful when coupled with the parent buffalo, and, so far as the experiments are recorded, no difficulty was experienced in raising offspring from the hybrids. Still more: there are two species of geese so distinct that they have been *generically* separated, i. e., the common goose (*Anser*) and the Chinese (*Cygnopsis*, *Cygnoides*), and yet not only have (1) hybrids been obtained, but those hybrids (2) were fertile with the parents, and (3) with each other, to an indefinite extent. In a state of nature, too, on the confines of the geographical limits of two species of woodpecker (*Colaptes auratus* and *Colaptes Mexicanus*), intermediate forms of all degrees are found, and in such numbers as to have produced a specific name (*Colaptes hybrides*), and the inference is that they are hybrids between the different species, and are fertile among themselves. Many examples of like and even excessive fertility of hybrids might be adduced in the case of plants. It must be admitted, however, that in a state of nature animals of the same kind prefer to associate together, and that *infertility, or diminished fertility, is the* RULE *when animals and plants of very different species unite.*

On the other hand, we have another curious assemblage of facts. The experiments of various investigators, and especially of Mr. Darwin and Fritz Müller, prove that, when flowers are dependent on self-fertilization, there is diminished fertility, and even barrenness, and every stock-breeder will testify to the impoverishment of stock by

interbreeding. In connection with the rule just referred to, then, we have to consider another, i. e., that *infertility, or diminished fertility, is the rule when animals and plants very closely related (by consanguinity) unite.* Sterility is thus a two-edged weapon which must be used with caution, or not used till we know more about it, and the accumulated evidence tends to show that there is every degree of fertility and sterility coördinated, but in not very definite ratio, with the affinities of the subjects.

The chief objection of many eminent naturalists of England, Germany, and the United States, to the view of species presented by M. Quatrefages, is its assumption that they are immutable. The works of Mr. Charles Darwin, published from time to time during the last ten or twelve years, have led to a wide-spread suspicion that varieties are incipient species, and that the prevalent sterility of species, when crossed, is due to changes in the reproductive system, brought about, if not in the same way as are the changes that produce varieties and races, that is, by natural selection, yet that they have arisen incidentally during the slow formation of species in connection with other and unknown changes in their organization. Darwin's work on the "Origin of Species" is filled with facts and arguments in support of this view. In his chapter upon Hybridism, Mr. Darwin says: "It is certain, on the one hand, that the sterility of various species when crossed is so different in degree, and graduates away so insensibly, and, on the other hand, that fertility of pure species is so easily affected by various circumstances, that for all practical purposes it is most difficult to say where perfect fertility ends and sterility begins. I think no better evidence of this can be required than that the two most experienced observers who have ever lived, namely, Kölreuter and Gärtner, arrived at diametrically opposite conclusions in regard to the very same forms. It is also most instructive to

compare the evidence advanced by our best botanists on the question whether certain doubtful forms should be ranked as species or varieties, with the evidence from fertility adduced by different hybridizers, or by the same observer from experiments made during different years. It can thus be shown that neither sterility nor fertility affords any certain distinction between species and varieties. The evidence from this source graduates away, and is doubtful in the same degree as is the evidence from other constitutional and structural differences." Again he says:

"I have as yet spoken as if the varieties of the same species were invariably fertile when intercrossed. But it is impossible to resist the evidence of the existence of a certain amount of sterility in the few following cases, which I will briefly abstract. The evidence is at least as good as that from which we believe in the sterility of a multitude of species. The evidence is, also, derived from hostile witnesses, who in all other cases consider fertility and sterility as safe criterions of specific distinction. Gärtner kept during several years a dwarf kind of maize with yellow seeds, and a tall variety with red seeds growing near each other in his garden; and although these plants have separated sexes, they never naturally crossed. He then fertilized thirteen flowers of the one kind with pollen of the other; but only a single head produced any seed, and this one head produced only five grains. Manipulation in this case could not have been injurious, as the plants have separated sexes. No one, I believe, has suspected that these varieties of maize are distinct species; and it is important to notice that the hybrid plants thus raised were themselves *perfectly* fertile; so that even Gärtner did not venture to consider the two varieties as specifically distinct.

"Girou de Buzareingues crossed three varieties of gourd, which like the maize has separated sexes, and he asserts that their mutual fertilization is by so much the less easy as their differences are greater. How far these experiments may be trusted, I know not; but the forms experimented on are ranked by Sagaret, who mainly founds his classification by the test of infertility, as varieties, and Naudin has come to the same conclusion.

"The following case is far more remarkable, and seems at first incredible; but it is the result of an astonishing number of experiments made during many years on nine species of Verbascum, by so good an observer and so hostile a witness as Gärtner: namely, that the yellow and white varieties when crossed produce less seed than the similarly-colored varieties of the same species. Moreover, he asserts that, when yellow and white varieties of one species are crossed with yellow and white varieties of a *distinct* species, more seed is produced by the crosses between the similarly-colored flowers than between those which are differently colored. Mr. Scott also has experimented on the species and varieties of Verbascum; and, although unable to confirm Gärtner's results on the crossing of the distinct species, he finds that the dissimilarly-colored varieties of the same species yield fewer seeds, in the proportion of 86 to 100, than the similarly-colored varieties. Yet these varieties differ in no respect except in the color of their flowers; and one variety can sometimes be raised from the seed of another.

"Kölreuter, whose accuracy has been confirmed by every subsequent observer, has proved the remarkable fact that one particular variety of the common tobacco was more fertile than the other varieties, when crossed with a widely-distinct species. He experimented on five forms which are commonly reputed to be varieties, and which he tested by the severest trial, namely, by reciprocal crosses, and he found their mongrel offspring perfectly fertile. But one of these five varieties, when used either as the father or mother, and crossed with the *Nicotiana glutinosa*, always yielded hybrids not so sterile as those which were produced from the four other varieties when crossed with *Nicotiana glutinosa*. Hence the reproductive system of this one variety must have been in some manner and in some degree modified.

"From these facts it can no longer be maintained that varieties when crossed are invariably quite fertile. From the great difficulty of ascertaining the infertility of varieties in a state of nature, for a supposed variety, if proved to be infertile in any degree, would almost universally be ranked as a species; from man attending only to external characters in his domestic varieties, and from such varieties not having been exposed for very

long periods to uniform conditions of life; from these several considerations we may conclude that fertility does not constitute a fundamental distinction between varieties and species when crossed. The general sterility of crossed species may safely be looked at, not as a special acquirement or endowment, but as incidental on changes of an unknown nature in their sexual elements.

"Independently of the question of fertility and sterility, in all other respects there seems to be a general and close similarity in the offspring of crossed species, and of crossed varieties. If we look at species as having been specially created, and at varieties as having been produced by secondary laws, this similarity would be an astonishing fact. But it harmonizes perfectly with the view that there is no essential distinction between species and varieties."

E.

It will occur to many of our readers that in this proposition a logical fallacy in the form of a *petitio principii* is involved. It is *assumed*—1. That fertility is an invariable criterion of varieties, and 2. That infertility is an equally invariable criterion of species, and, as expressly urged, no *structural* evidence is sufficient to gainsay that evidence. Applying these criterions—(1) inasmuch as no limit has been found to the fertility between the common goose and the Chinese goose, those animals are of the same species, and (2) inasmuch as no fruit has been obtained from individual flowers of the same plant of certain species of lobelia, passion-flowers, orchids, etc. (although fertile with those of other plants), those individuals belong to different species! The *reductio ad absurdum* is indeed completed by the terms of M. Quatrefages's propositions, and the facts confronting them.

F.

Other views are entertained by eminent archæologists. In an address before the Oriental Society of London, September 20, 1874, Prof. Richard Owen makes a strong claim as a geologist for the recognition of far more extended periods of time since the appearance of man than are usually allowed by anthropologists. He states that probably we must remove the scene of the origin of man to another continent, which has been since submerged, leaving only an archipelago. Prof. Owen says:

"The Papuans of New Guinea, with cognate dark-skinned, crisp-haired, prognathic peoples of Australia, New Hebrides, New Caledonia, and neighboring islands, bespeak by affinities of their rude dialects, as well as by physical characters, a low and early race of mankind, which in some respects indicate kinship with the Boschismen of South Africa, but are yet sufficiently distinct to suggest a long term of existence in another and distant continent. Zoological and geological evidences concur, as in a degree exemplified in Wallace's 'Malay Archipelago,' to point to a prehistoric race of mankind, existing generation after generation on a continent which, in course of gradual, non-cataclysmal, geological change, has been broken up into insular patches of land; there such race is still open to ethnological study. Wending westward to regain the proper field of our congress, we have evidences of as early—if I say 'primitive' it is because we know none earlier—bipeds, in the trans-Gangetic peninsula and Indonesian Archipelago. These Nigritos, in India, have fled before invaders from the sub-Himalayan range, represented by Burmese and Siamese; before invaders from the South, the Malays, with their maritime advance in civilization; before later immigrations from the North, with the religion and literature respectively of the Aryan Hindoos and the Arab Mussulmans. Fragments of the dwarf Nigrito stratum may be picked up—a scanty one in Engomho, the largest island off Sumatra, in the Mergui Archipelago, in the Nicobar Isles, and in the Andamans. The Nigritos who have survived such changes, and have been caught, so to speak, upon a new con-

tinent, have preserved themselves in mountain fastnesses and forests, have fled before later immigrants, have never assimilated therewith, have always been looked upon by them as prior in time, and now are verging toward extinction. In speculating, therefore, on the place of origin of Mincopics and hill-tribes, I would impress upon ethnologists to set aside ideas of the actual disposition of land and sea as being necessarily related thereto, and to associate with the beginning of such low forms of humanity a lapse of time in harmony with the latest geological changes of the earth's surface. . . . The cardinal defect of speculators on the origin of the human species seems to me to be the assumption that the present geographical condition of the earth's surface preceded or coexisted with the origin of such species."

G.

Some of our readers will hardly be prepared to learn that M. Gratiolet scarcely knew any thing whatever from autopsy of the development of the brain in any of the true apes (*Simiinæ*), and that the only basis for the strong statements made in the text is as follows:

"I have found," says Gratiolet, "by a careful comparison of adult brains in men and monkeys, *that they are arranged in the same plan as to the gyrations*, and, when the view is thus limited to the adult structure, there is no marked ground for separating them. But, in studying the development, I find that in apes" (monkeys) "*the gyrations of the posterior lobes appear before* those of the anterior lobes, which is just the reverse of the succession in man." The differences, in fact, simply amount to this:

(*a.*) In man the appearance of the superficial convolutions is accelerated toward the anterior portion of the cerebrum, and to such a degree that those of the anterior lobe are first developed.

(*b.*) In monkeys the development of the same convolutions is retarded, and consequently those of the temporal lobes are first developed.

Such are the differences which isolate man from "animals!"

But even such differences, as already intimated, have not been verified, in the case of the apes; and far from the inference being a necessary one that their development will be the same as in the lower monkeys, it is scarcely legitimate as a provisional one, inasmuch as the higher apes in many features notably resemble man more than the monkey, and it may be that they represent an intermediate stage, or even that they approximate most to man in those respects. At least the statement in the text is premature.

But perhaps the same succession may be verified in the apes as in monkeys; and there are parallel cases which M. Quatrefages has neglected—notably the development of the teeth.

The teeth are essentially similar in man and the apes (as are the convolutions, according to M. Gratiolet), "but, in studying the development," it is found that in apes the hindmost (as well as other) grinders appear before the canines of the second set, "which is just the reverse of their succession in man," in whom they are cut after the canines (eye-teeth) of the second series; and in this respect the lowest apes (gibbons) most nearly resemble him!

Inasmuch, however, as there is no *exact* ratio as to dates in the relative appearance of these teeth, any more than there is in the development of the convolutions of the brain, although the formal antithesis may appear striking, in reality, there is a gradual transition from one type to the other, and it would be unsafe for man to base his tenure to manhood in the possession of any such differences. A little acceleration of the one, a little retarda-

tion of the other, would result in approximation; in time, if continued, would bring coincidence, and finally reversal of development.

H.

This very decided opinion of Quatrefages's may be met by the equally decided counter-statement of Mr. Darwin, as given in his work on the "Descent of Man." In summing up the evidence and arguments which he has employed, he says that the conclusion now held by many competent naturalists is, that man is descended from some lower and extinct form. The close similarity between man and the lower animals in embryonic development and in bodily structure and constitution, the rudimentary organs he retains, which are regularly present and highly serviceable to many animals, and the reversions to which he is liable, are facts which cannot be disputed. They have long been known, but told us nothing of the origin of man, till viewed by the light of our recent knowledge. It is now seen that the great principle of Evolution stands up clear, firm, and unmistakable, when these facts are considered in connection with the classification of organized beings, their geographical distribution and geological succession. It is incredible that all these facts should speak falsely. A careful study of the phenomena of Nature, in their connections, forces us to admit that the close resemblance of the embryo of man to that, for instance, of a dog, the construction of his skull, limbs, and whole frame, on the same plan as that of other mammals—the occasional reappearance of various structures, which man does not normally possess, but which are common to the quadrumana, and a crowd of analogous facts—all point in the plainest manner to the conclusion that man is the co-descendant with other mammals of a common progenitor, that we car

approximately place in its proper position in the zoological series. We thus learn that man is descended from a hairy quadruped, furnished with a tail and pointed ears, probably arboreal in its habits, and an inhabitant of the Old World. This creature, if its whole structure had been examined by a naturalist, would have been classed among quadrumana, as surely as would the common and still more ancient progenitor of the Old and New World monkeys.

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